SPECIAL REPORT: A Fearless Look at the Future of Home Computer Technology

POPULAR COMPUTING®

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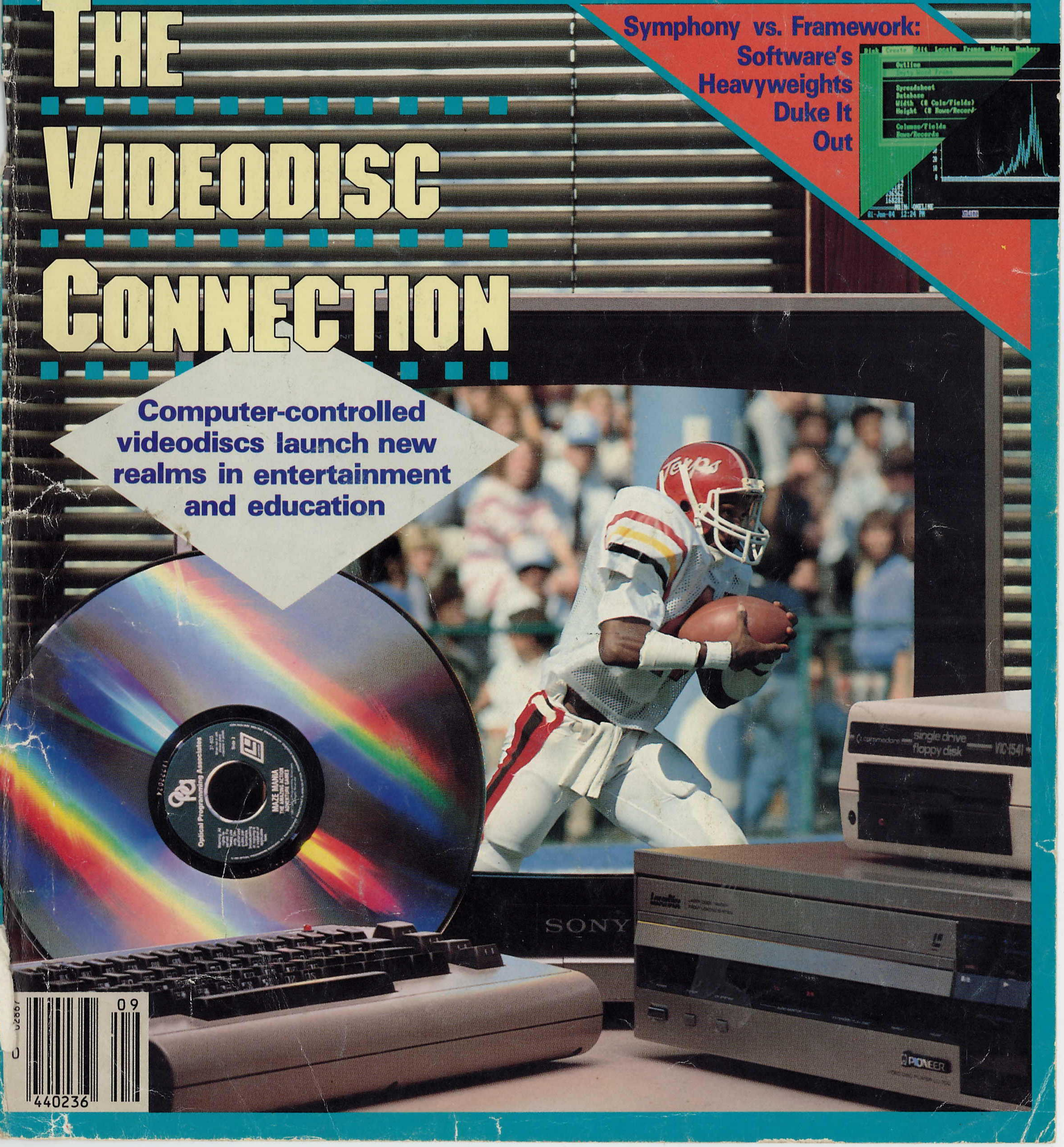
THE VIDEODISC CONNECTION

Computer-controlled videodiscs launch new realms in entertainment and education

Symphony vs. Framework: Software's Heavyweights Duke It Out



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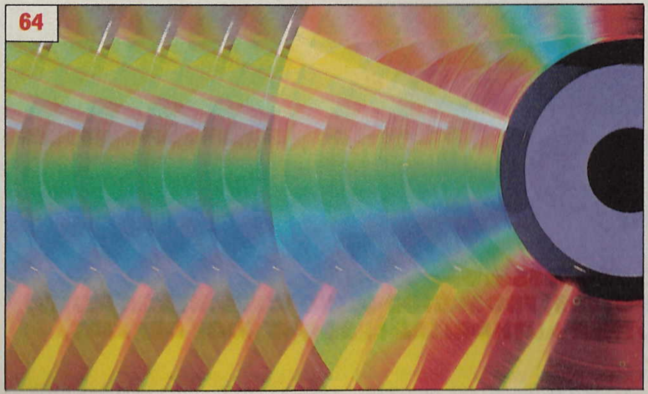

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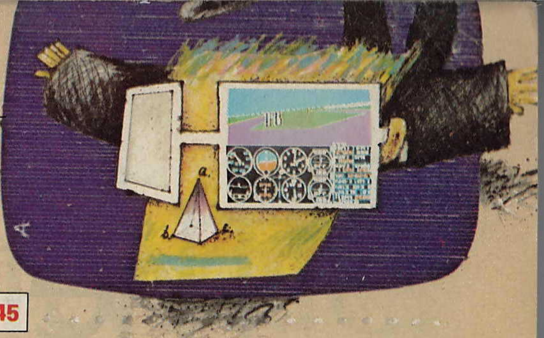

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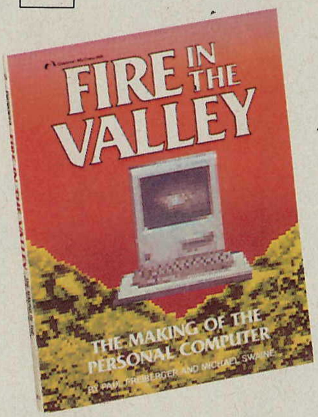
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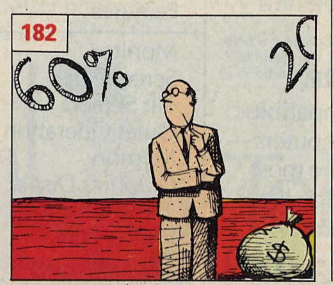

Popular Computing is published monthly, with an additional issue in October and December, by McGraw-Hill Inc., with offices at 70 Main St, Peterborough, NH 03458. Office hours: Mon-Thur 8:30 a.m.-4:30 p.m., Friday 8:30 a.m.-Noon, Eastern Time. Address all mail except subscriptions to POB 397, Hancock, NH 03449: phone (603) 924-9281. Address all subscriptions to Popular Computing, POB 307, Martinsville, NJ 08836. **Postmaster:** Send all changes of address to Popular Computing, POB 387, Martinsville, NJ 08836. Address all freight shipments to 70 Main St, Peterborough, NH 03458. Second-class postage paid at Peterborough, NH 03458 and additional mailing offices. (ISSN 0279-4721). Subscriptions are $15.00 for one year in USA and its possessions. In Canada and Mexico, $18.00 for one year. In Japan, 10,400 yen for one year surface delivery, 19,700 yen for one year air delivered. Other foreign countries $21.00 for one year surface delivery. Single copy price is $2.50 in the USA and its possessions, $2.95 in Canada and Mexico, $4 in Europe, and $4.50 elsewhere. Foreign subscriptions and sales should be remitted in United States funds drawn on a US bank. Printed in United States of America. Address all editorial correspondence to the editor at Popular Computing, POB 397, Hancock, NH 03449. Unacceptable manuscripts will be returned if accompanied by sufficient first-class postage. Not responsible for lost manuscripts or photos. Opinions expressed by the authors are not necessarily those of Popular Computing.

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Bananas 25 22 20 16 10
Sugar Cane 40 41 42 43 44
Annual Sales
21.3% Pineapples
12.8% Limes
21.3% Bananas
44.7% Sugar Cane
TropiFruit Sales
150
100
50
0
'81 '82 '83 '84 '85
Pinea
Limes
Banan
Sugar
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Tilt Screen	YES	NO	YES	NO
Quiet Operation	YES (NO FAN)	NO	YES	NO
Memory	128K	128K OPTION	256K	256K OPTION
Graphics Display (640 x 200 resolution)	YES	OPTIONAL	YES	OPTIONAL
Printer Port	YES	OPTIONAL	YES	OPTIONAL
Communications Port	YES	OPTIONAL	YES	YES
MS™-DOS/BASIC®	YES	OPTIONAL	YES	OPTIONAL
System Expansion Slot	YES	YES	YES	YES
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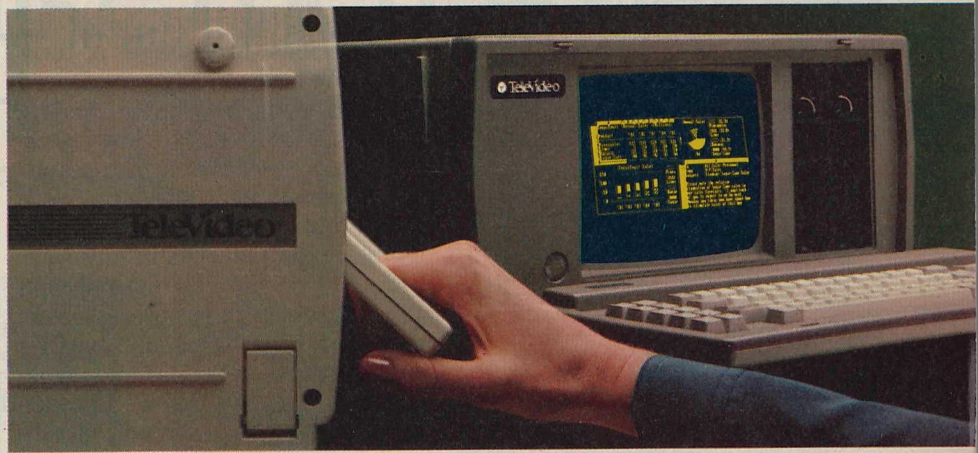

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What is perhaps most impressive about the TeleVideo IBM PC Compatible can be found deep within its circuitry. We use the same 8088 central processing unit that runs an IBM PC. But we also employ new VLSI (Very Large Scale Integration) microchips that are designed and built exclusively for TeleVideo. These interface more efficiently with the powerful 8088 and yield numerous benefits.

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Features	TPC II-S	IBM PC
High Capacity Storage	YES	YES
Quiet Operation	YES (NO FAN)	NO
Display	YELLOW	AMBER
Memory	256K	256K
Graphics	YES	YES
Communications Port	YES	OPTIONAL
Printer Port	YES	OPTIONAL
MS™-DOS 2.11	YES	OPTIONAL

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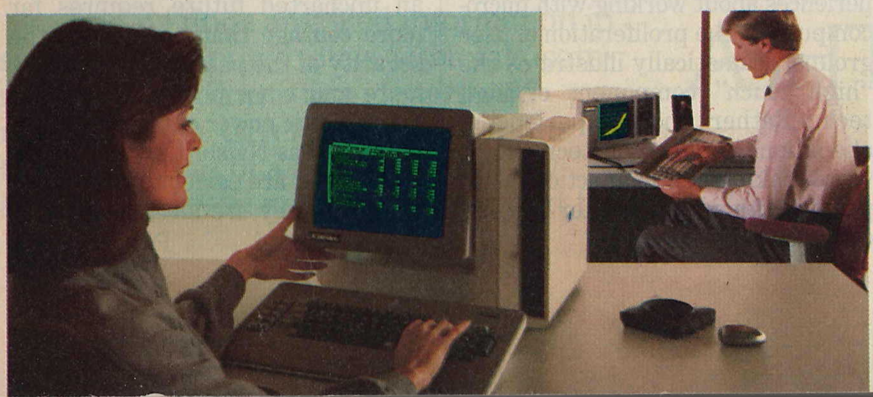

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New Choices, New Freedoms

In his book *Megatrends*, John Naisbitt describes three stages of technology. We have already experienced the first, in which we applied microprocessors to the path of least resistance—toys and games. The resulting entertainment devices were novel and fun and did not threaten our basic life patterns in any way.

Rapidly we moved to the second stage, embracing microprocessors as improvements over our existing tools—cars, telephones, and typewriters, to name a few. Because these changes represented concrete improvements, we had little trouble accepting them, either.

The versatility of microprocessors also makes it possible for us to move closer to the third stage, where we use them to create and produce things suggested by their very nature. But this technological power, or versatility, is also bringing about major changes that threaten our traditional values and institutions.

Naisbitt identified several major transformations now taking place, and we who use microcomputers can easily see how our involvement with them puts us squarely in the middle of this revolution.

Already software packages help us prepare our taxes, monitor physical fitness, and educate ourselves in our own living rooms. Microcomputers are accelerating our move to self-help, making us less dependent on institutions for our survival and well-being.

Every night across the country, people gather in classrooms, living rooms, and meeting halls to exchange information and share experiences about working with microcomputers. The proliferation of user groups, dramatically illustrates the "high touch" component of high tech. Rather than experiencing alienation because of technology, we're making new connections with people without regard for age, income, or profession.

And we're exercising the power of our pocketbooks in the microcomputer marketplace, rejecting products that don't meet real needs despite the billions of dollars invested in marketing and advertising efforts. Many of us have become activist consumers, not hesitating to call or even visit corporations to voice our opinions about their products, pricing, and policies.

And while some people decry the proliferation of hardware and software products, we've rapidly grown accustomed to a multiplicity of choices. From telephone services to ice cream, each one of us can pick and choose the product that best meets our needs. And beyond simple buying decisions, the microcomputer lets us determine how to educate our kids, decide to work from home via terminal rather than in person at the office, and build our own invaluable information databases. Once we've experienced freedom of choice, who can support a return to a restriction of options?

The microcomputer also radically changes our power in a corporate environment. Functions that have always been consolidated can now be spread throughout the company, as we acquire the computing resources and skills to handle them. And as our companies move to decentralized computing power, decentralized control must follow. Flexible scheduling, individualized work environments, and participatory decision-making, now possible, soon become inevitable.

As these changes emerge, however, resistance builds. Moving into an uncharted future requires far more courage than clinging to the security of the past. But every day, more and more people experience the catalytic power of the microcomputer, and as Naisbitt says, "Trends, like horses, are easier to ride in the direction they are already going."

Pamela Clark

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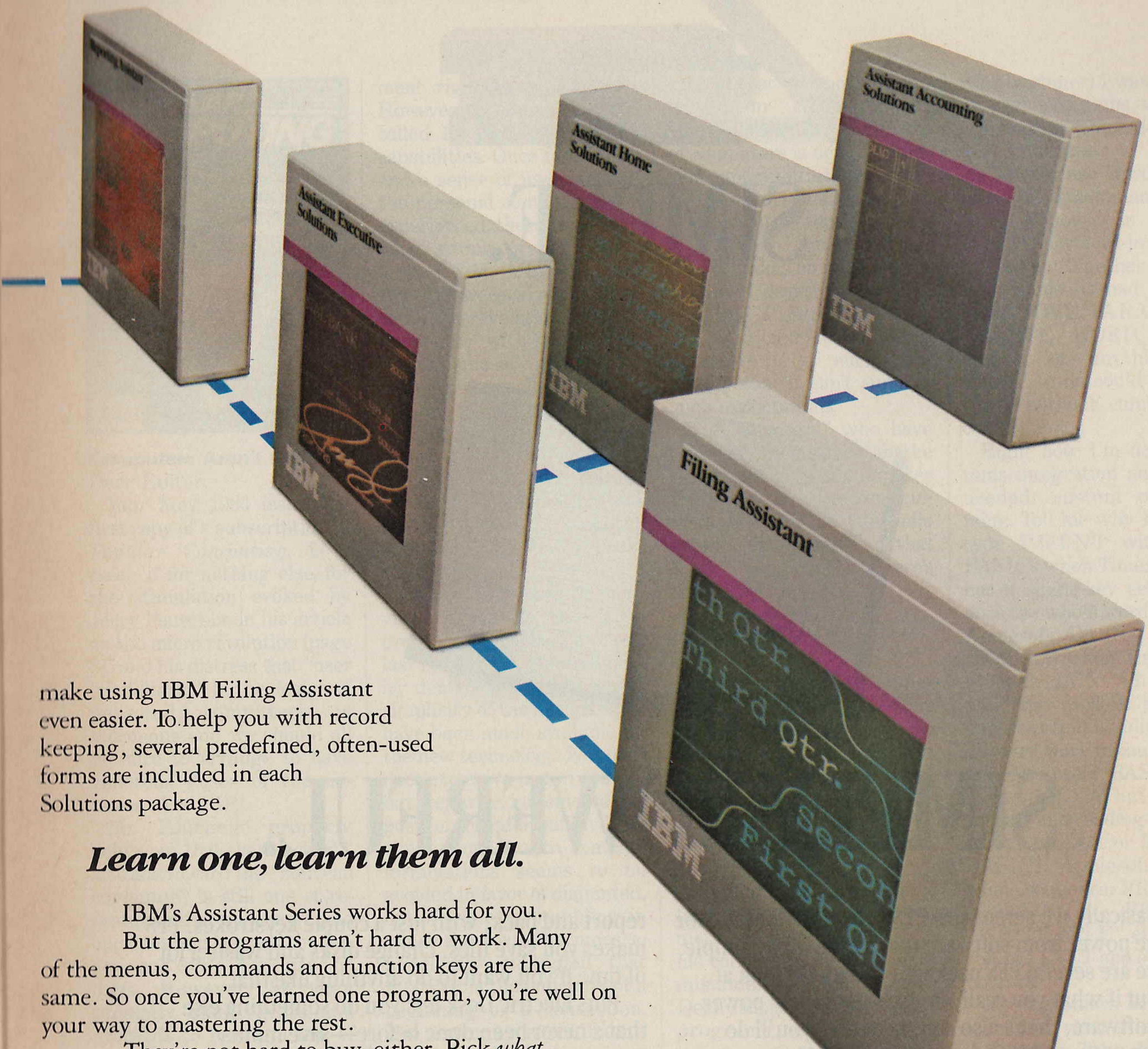

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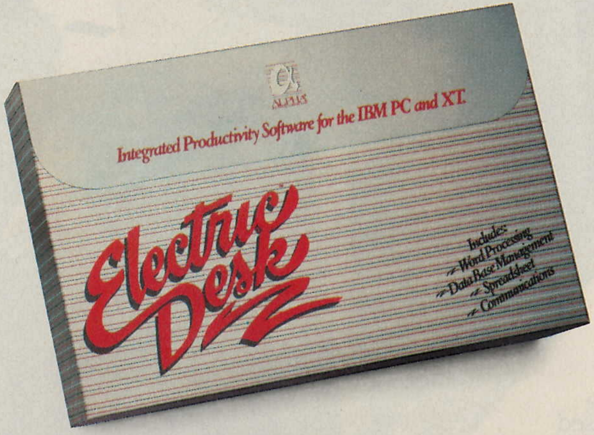

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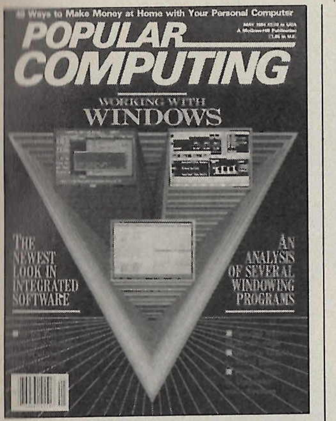
LETTERS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Computers Aren't Friendly

Dear Editor:

Your May 1984 issue, my first copy of a subscription to *Popular Computing*, is a treat, if for nothing else, for the stimulation evoked by Jerry Pournelle in his article on the micro revolution (page 81) and his distress that "user friendliness" in the design of personal computers is poisonous and we should all be sure to arrange to have generous doses of the antidote, A> PIP.

Mr. Pournelle properly points out that the "hacker's" attitude toward the "nouveau computee" is still one of resentment that we haven't paid our dues and learned the jargons and codes of the good ol' days. However, he then promptly shifts gears and proceeds to berate a few of the designers of user-friendly personal computers for the way in which they have marketed their designs, with his particular animadversion about promotion of user friendliness over the design elements built in and readily available to those of greater knowledge and experience.

In at least one instance, with which I am personally familiar, the designer did indeed provide extensive manuals and documentation of standard CP/M and MBASIC for CP/M-80 with his equipment right from the start. However, the immediate need called for the user-friendly capabilities. Once familiarity and a sense of usefulness of the personal computer were experienced, there emerged a very strong urge to learn what CP/M, MBASIC, and A> PIP were all about. Now came the revelation that Mr. Pournelle, with all his insights, missed completely. Lest Mr. Pournelle think that I'm out for his hide alone, I hasten to direct my comments to personal computer designers and writers of manuals, documentation, and the plethora of computer books available in the bookstores.

One is tempted to the conviction that this material is prepared by hackers as their last resort to retain exclusivity denied by the increasing simplicity of the designs that have been made available by the new technology. Not only does excessive jargon prevail, but step-wise, incremental exposition of information from simple concepts to complex formulations seems to be avoided in favor of disjointed, out-of-sequence rambling in which the novice becomes so hopelessly entangled that A> PIP is the end and not a beginning or a connection. The newcomer is told that his new acquired computer varies somewhat from the text, but the variation isn't explained. Or the instruction calls for the use of a utility program whose source is not divulged.

A catalog of the comedy of errors isn't necessary. Any recent purchaser of a personal computer who is a beginner could write an all-too-familiar horror story. What Mr. Pournelle's insight amply did reveal on several occasions, he really didn't emphasize adequately. I can agree with him totally that the novice who waits for extension of simplistic solutions to the use of computers is denying himself opportunities to expand his own horizons as well as the output potential of his tool. I cannot agree with him that it "takes no more than a couple of days to cope with A> and PIP A:=B:*.* [v], etc." Available instructional literature is of such poor quality that it can't support such expectations.

The "teachers" who have assigned themselves as the elect purveyors of computer knowledge are the real culprits to whom Mr. Pournelle should be protesting that timely complaint, "where's the beef?"

Abraham Wolfthal
Silver Spring, MD

*I quite agree that neither editors nor writers have done an entirely adequate job. My point is that if you wait for it to be too easy, everyone will be ahead of you.—**J.P.***

Hates Arcane Commands

Dear Editor:

Hate to take issue with my favorite computer writer, but methinks Jerry Pournelle, in his column in the May issue, misunderstood Mr. Dean. Dean talks about open-ended programs, but Pournelle rebuts by talking about operating systems and their commands.

When I write a program, fine, I'll cope with the PIP and whatnot of the DOS. When I *buy* a program to do a job, I *don't* want to have to figure out arcane commands. Dumbest thing I ever saw was a series of programs sold for the Timex/Sinclair 1000 that you have to start yourself by typing RUN, ENTER. It was dumb because within six weeks of starting to program (which means I was still a rank beginner) I was writing my own programs so they'd self-start on completion of the load from tape.

I'll never use Wordstar because of its command structure. Phooey. In 1975 I worked on a word-processing system put together by DEC with minis—it had keys labeled MOVE, PARA, SENT, DELETE, WORD, CHAR, and so on—anything you wanted to do could be done easily without cumbersome control codes.

Right now I'm doing systems integration and (when needed) custom programming. Tell me why I have to type P-R-I-N-T with some BASICs when Timex BASIC has a single-key setup that does the whole word. Or why Applesoft BASIC requires LEN (A$) when Timex gets by with LEN A$. I don't mind the work of programming but find it ridiculous to do extra work because Apple and Microsoft BASICs are backward. What about writing and reading disk files from Applesoft or Microsoft BASIC? Applesoft has a whole sequence: PRINT D$; "OPEN FILE...PRINT D$; "WRITE FILE" etc. Microsoft has LSET and other such horrors.

My customers at the moment don't want to know from A prompts. They don't want to spend $6000 and some change to turn the thing on and get that dumb A staring at them. The IBM PC for that price doesn't even have a clock! So if they want to do anything, they have to tell the thing the time and date (yes, they can bypass this if they want, but then they don't get date and time stamping of files).

I believe that, later, many of them will get into some learning and DOS commands and such, which I agree is good.

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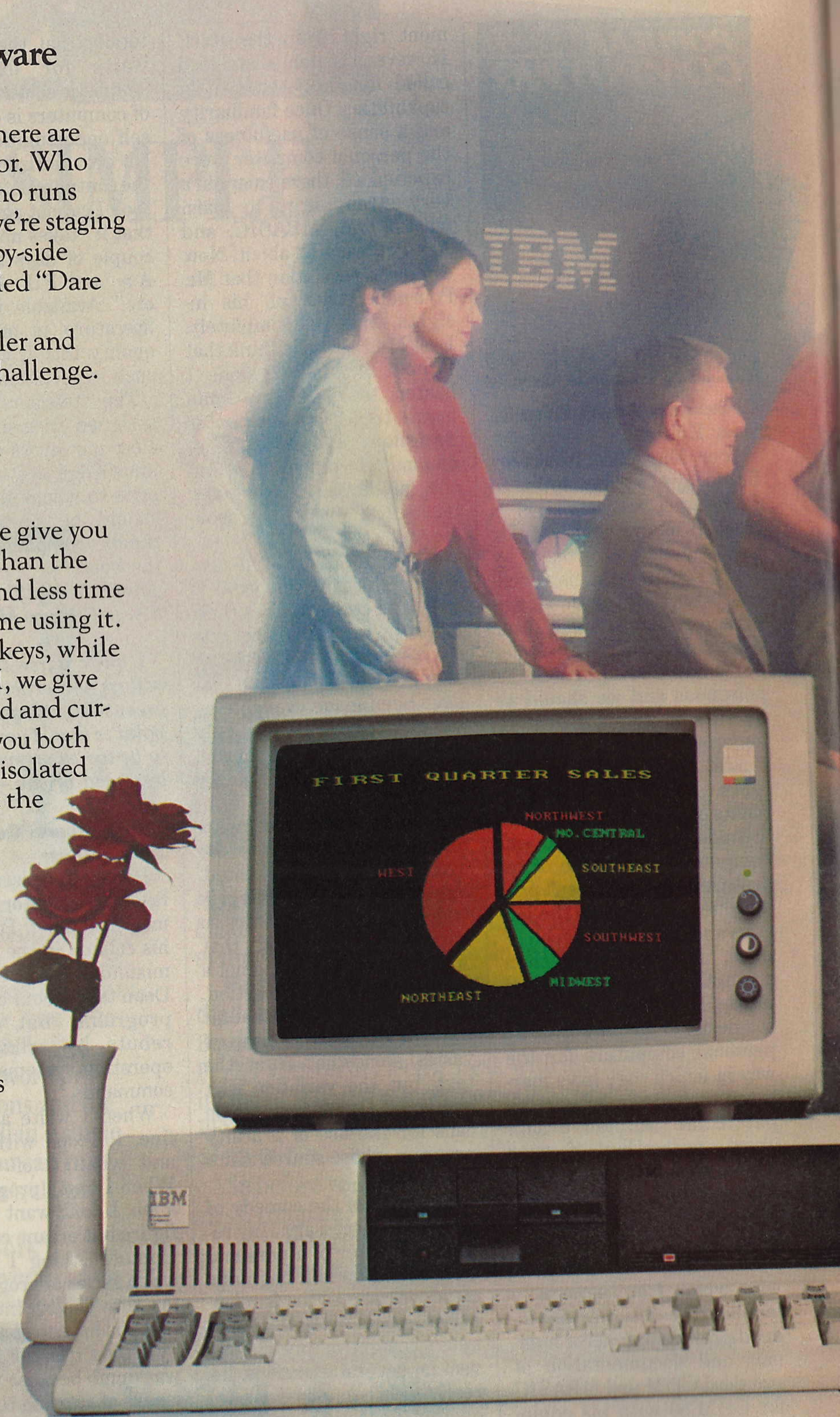

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But to begin, they want the computer to do a job. I don't think it's a case of being lazy—it can take a long time to get familiar with operating systems and programming languages. Even supposedly simple-to-use programs such as Lotus 1-2-3 can take months to learn if you're trying to run a business or a law practice at the same time.
John G. Sandell
Moorestown, NJ

*Thanks for the kind words. I would have thought that learning that "?" = PRINT takes sophistication. It seems to me we are agreed: things haven't got that "user-friendly" yet. The question is, what do we do now?—**J.P.***

Review Too Kind

Dear Editor:

I have just read the review of *How to Get Started with MS-DOS* by Carl Townsend in your March 1984 issue (page 203). I think that the reviewer was much kinder to the book than it deserved.

Of the 126 pages in the book, nine are completely blank and six have fewer than 50 words on them. Many are duplicates of other pages. For example, the lists of command structures, editing commands, and IBM BASIC statements, which are spread out over eight pages in the body of the book, are repeated on another eight pages in the Appendix. There are twelve pages of IBM error messages and eight pages of definitions of words like *data, memory,* and *printer.* Many of the charts are available in the IBM PC and MS-DOS manuals. The author appears to have written a very thin book which the publisher, Dilithium Press, fattened with unnecessary charts and lists.

Although its title claims that the book deals with MS-DOS and the back cover claims that it deals with eleven named computers that use the Microsoft operating system, the text deals exclusively with the IBM PC and PC-DOS. Chapter 5 begins with a discussion of 8-inch disks. How many PC owners have 8-inch drives? Townsend then assumes the reader has only floppy drives and ignores hard disks entirely.

There is almost nothing in the book that is not contained in the manuals that come with the machines or the operating system disk. No hints, no shortcuts, no discussion of possible problems and their solutions. For $13.95 you can buy five issues of almost any computer magazine and get ten times the useful information contained in this book.
Richard S. Semel
West Orange, NJ

A Consumer's Market

Dear Editor:

I'm writing this letter in response to the editorial in your April 1984 issue, "The Responsibility of Leadership." I must admit that I quite agree with your assessment of IBM's future plans. However, I also maintain that it is we the consumers and not the manufacturers who are the leaders in this or any other marketplace. Let me explain.

Computer manufacturers can build only that which we, as consumers, will buy. If they don't, then they won't sell their products. They can spend prodigious amounts on advertising, but if it doesn't suit our needs or can't convince us that our lives will be better served by this product, then we won't buy it. Period. No sales, no following.

Any company can go ahead and try to see if it can create a consumer-dependent market, but I guarantee that it will come out on the short end of the stick. That's the reason we are micro users in the first place: we are looking for something better than the commonplace, everyday way of doing things.
Jerry Perillo
Placerville, CA

Wrong Illustration

Dear Editor:

There's a bug in the illustration on trapping in your tic-tac-toe article (The Program Factory, June 1984, page 214). Player 0 is *not* trapped—he can win in one move!

Because there are three Xs and two 0s on the grid, it's evidently Player 0's turn. He has but to mark in the upper right corner of the grid (row 1, column 3) and he wins with a row-of-three across the top.

In the process, of course, he blocks Player X's diagonal of top-right-to-bottom-left, but that's academic.

Trapping is a valid strategy, but giving up a game to do it isn't recommended.
Jack E. Blake, APR
Madison, WI

You're correct. The diagram should have looked like this:

	O	*
O	X	
X	X	*

Player 0 is trapped because Player X has two winning moves, indicated by asterisks.

The Dream Option

Dear Editor:

After reading Steven Levy's column in the June issue, I sympathize with his view that the people who use the so-called cheat editors are cheating only themselves. On the other hand, I can also sympathize with adventurers who, due to a small oversight, lose their prize character.

I think I have a viable alternative. After the end of an adventure, the program will ask the participant if it was only a dream. If the player responds yes, the whole scenario—including new experience points, gold, magic items, etc., accumulated since the last time the game was played —will be removed from the character's profile.

Just as some people work their problems out in their dreams, a player might do the same with the adventure game. As I see it, the dream option would allow for more experimentation and learning.

Nothing is lost by trying different plans of attack; but a player cannot gain the booty until he is smart enough to dodge the enemy, kill the monster, or steal the treasure, leaving the computer with a greater sense of accomplishment. And as Levy pointed out, this feeling of accomplishment is what makes the game so appealing.

Another advantage of the dream option is that someone with a higher-level character can allow another person to play his character without fear of losing his champion.
Timothy J. Sorber
State College, PA

How Basic Is BASIC?

Dear Editor:

We are writing in response to Mike Nicita and Ron Petrusha's review of our book *Armchair BASIC* (Osborne/-McGraw-Hill, 1983) which appeared in your May 1984 issue (page 188).

Somebody really blew it when they gave the book to those two! As we stated in our preface, this book "is designed for people who have no prior experience with computers." We suggest, in all fairness to your readers, that you let some real beginners review *Armchair BASIC* and see what they have to say.

Armchair BASIC is just what it professes to be: "An Absolute Beginner's Guide to Programming in BASIC." It is currently in its fourth printing and has been translated into German, Spanish, and Danish. And although it's probably safe to say that none of the world's great programmers use it as a reference text, it is obviously working quite well for the audience for which it was written.
Annie and David Fox
San Anselmo, CA □

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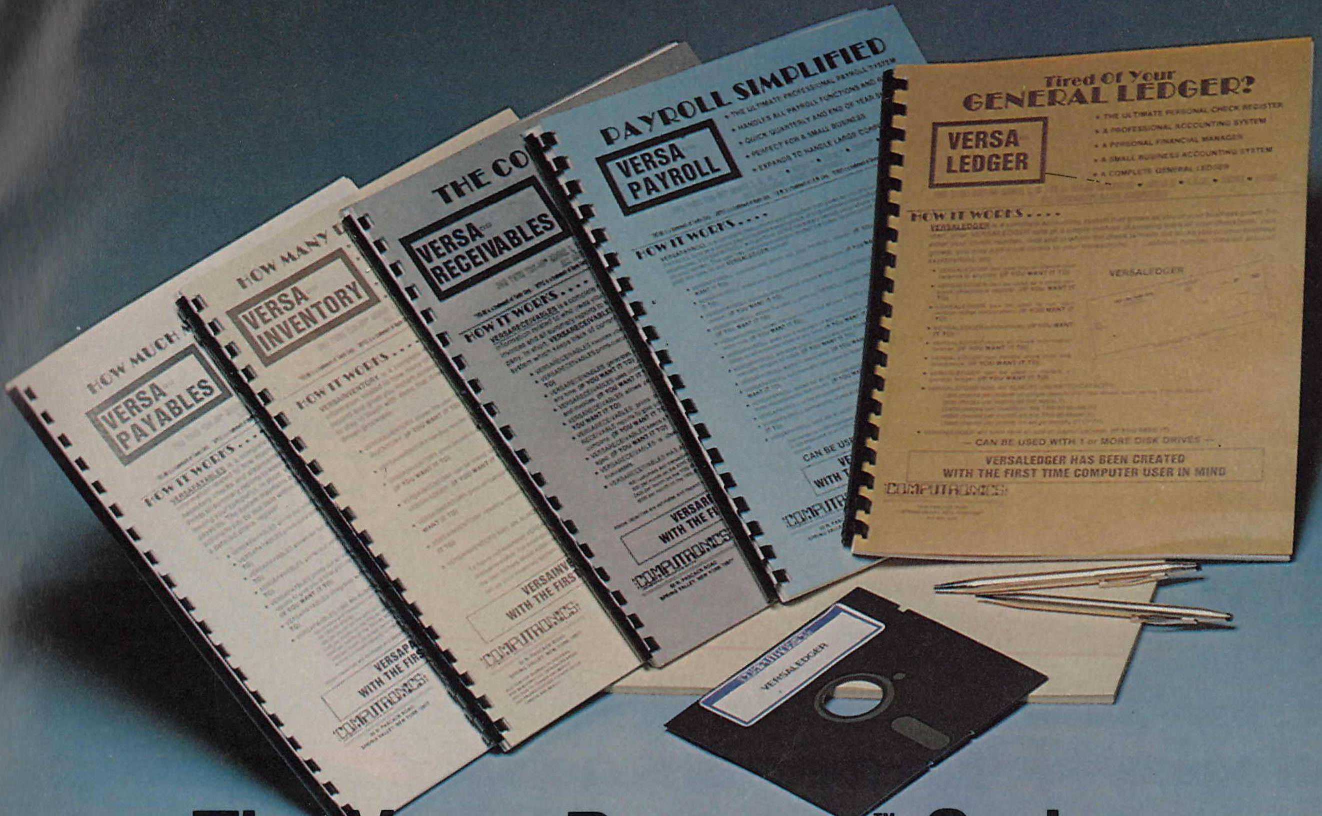

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Apple's "Populist" Image Campaign

The rags-to-riches success story of Apple Computer Inc. sounds like the plot of a Horatio Alger novel. You know the story, of course: two young guys build a microcomputer in a garage, go on to create a billion-dollar company, and thus save humanity from the rigid, high-priest mentality of the well-established giants of the industry.

Now Apple seems to be taking on aspects of the Populist movement of the late nineteenth century. That might sound like a difficult role for a Fortune 500 company, but if any firm can fill it, Apple can. It already has a bit of a populist public image, and the firm is working very hard to foster and preserve it. The Macintosh advertising slogan, "The Computer for the Rest of Us," is a perfect example.

Apple's populist tendencies come through most blatantly at their sales meetings and product introductions. Most companies are content simply to show a new product, answer questions, and hand out literature. Not Apple. The firm's product introductions are more like Fundamentalist revival meetings, with a carnival-tent atmosphere suggesting that salvation is owning an Apple computer. The meetings are complete with cheering, standing-room-only crowds, and ovations for founders Steve Jobs and Steve Wozniak. All that's missing are a few "Amens" punctuating the well-orchestrated hype.

Apple introduced Macintosh at its annual shareholders meeting in January, turning what is usually a relatively routine event for any public company into an extravaganza. Just as at exclusive Hollywood movie premieres, lines gathered outside, and shareholders who couldn't get in formed an angry mob. The Macintosh unveiling featured a multimedia slide show along with a new song in the style of "Flashdance" called "We are Apple. . .What a Feeling!"

Photograph by Mike Blake

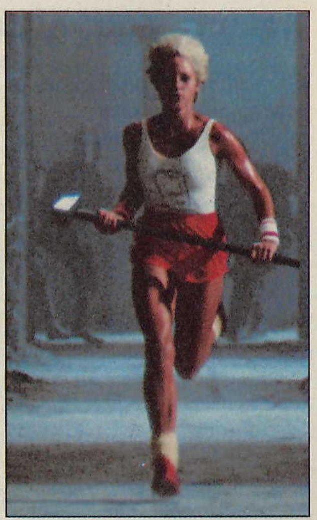
The 1984 Apple look: trendy sportswear and (below) . . .

The recent IIc announcement followed the same script, but with even more pizzazz. Apple staged a daylong $2-million love fest for dealers and software developers called "Apple II Forever." The day started with a slide show that traced the company from Jobs and Wozniak in that mythic garage until the present, set to the tune of the Beatles' song "Two of Us." The audience loved it. This was followed by a loud jazz/rhythm and blues concert by Herbie Hancock. Some attendees even wondered aloud whether Apple had planned the minor earthquake that shook San Francisco that day. Amid the cheering, you could almost forget that the point of all this was to sell computers. But in this respect, the day was a resounding success—Apple received orders for more than 50,000 IIc's.

"Macintosh. The Computer for the Rest of Us." The slogan not only reinforces Apple's image as a populist company, but carries with it the not-too-subtle message that someone wants to keep computers only for an elite few. That message surfaced even earlier, in Apple's attention-grabbing "1984" television commercial that flashed across TV screens during the Superbowl. The commercial—which was directed by Ridley Scott, whose credits also include *Alien* and *Blade Runner*—cost $400,000 plus the television time. In case you've forgotten, the Apple commercial depicts a world where everyone looks alike. Suddenly a young, beautiful female runner heaves a sledgehammer into a huge TV screen showing the face of "Big Brother." The tagline indicates that Apple is introducing Macintosh "so that 1984 won't be like *1984*."

Like any populist movement, Apple's requires a villain, a "Big Brother." And the firm seems to have found the perfect adversary in International Business Machines Corp. IBM is an easy target because it is so phenomenally successful. How successful? Consider that in the first three months of 1984, IBM reported net profits of $1.2 billion on sales of $9.5 billion. For comparison, Apple Computer had total sales for the first three months of 1984 of $300.1 million and profits of $9.1 million. In other words, IBM's profits on an average day are higher than Apple's for an entire quarter.

IBM is also an easy mark because of its well-known corporate policies covering everything from employee dress to a penchant for secrecy that includes six levels



. . . Apple's (TV ad) avenger.

of classification of information. But Apple is not without conceits of its own. Many people at the firm speak of Apple "inventing" the personal computer. It sounds good, but it's simply not true. MITS, a small firm based in Albuquerque, New Mexico, took out the first advertisement for a personal computer, the Altair 8800, in January 1975. Imsai, Sol, and others had already entered the market before Apple's 1977 debut.

So why does Apple get credit? Because it's still around, whereas most of the earlier companies have faded into obscurity. Actually Apple owes its success in large part to many software companies that have written programs for the machine.

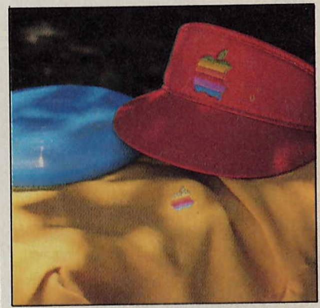
IBM's story is not all that different. Remember, IBM did not create the mainframe computer. Other companies, like Univac, were the early leaders. Univac hasn't completely vanished—it's been absorbed into Sperry Corp.—but it's almost invisible. And why has IBM prospered? Primarily because shrewd marketing gave IBM the image as *the* manufacturer of large computers.

Still, there are more differences than similarities between the two companies. At Apple, blue jeans and T-shirts are de rigueur, in contrast to IBM's traditional business suits. And most of Apple's attempts at secrecy have been less than successful.

From the Apple Collection: clipboard and portfolio for Apple buffs.

Apple's lighthearted ways have endeared it to its customers. There's even a new catalog called "The Apple Collection," which features sun visors, clothing, luggage, and accessories all sporting the Apple logo. Among the items: $14 running shorts, a $120 men's warm-up suit, a $39 director's chair, coffee mugs, lapel pins, bumper stickers, and an $899 sailboard. Somehow, I can't imagine a legion of PC owners walking around in T-shirts emblazoned with the blue IBM logo.

Fear of IBM appears to be a major factor behind Apple's newfound populism. While Apple chairman Steven Jobs is the movement's William Jennings Bryan, the marketing campaign owes its verve to Apple president John Sculley, the man who previously brought us the Pepsi generation.



Apple-wear: visor and shirt.

Early this year, Sculley said he did not see any firms other than IBM and Apple surviving the current shakeout among personal computer companies. "We think it's quite clear IBM has no intention of sharing its market with anyone else."

Sculley may or may not be right about IBM's intentions or about the future state of the computer market. But if concern about IBM leads to a populist strategy, perhaps we shouldn't complain. After all, the whole industry would be in better shape if firms were more concerned about servicing their customers rather than reaping short-term profits. So far, at least, Apple has not substituted "populist" for "personal" in its corporate slogan. But that may be next.

—Michael J. Miller

Training Future Doctors

We've all heard predictions of how computers may one day replace physicians as diagnosticians. But what about a computer that replaces the patient?

That's the case at the Medical College of Georgia, where students are using a computer-laser disc instruction system to diagnose and treat a hypothetical heart patient.

Students "meet" a 36-year-old man who has arrived at a hospital emergency room complaining of chest pains. The students then ask the patient questions that determine his medical history. The program looks for key words and automatically branches to an appropriate patient response. For example, if a student asks, "Do you smoke?" the computer accesses that part of the laser disc showing the patient answering: "Let's see. I've been smoking two packs a day for about two years." If a student asks whether there has been any history of heart disease in the patient's family, the man on the screen says, "No. I don't think so."

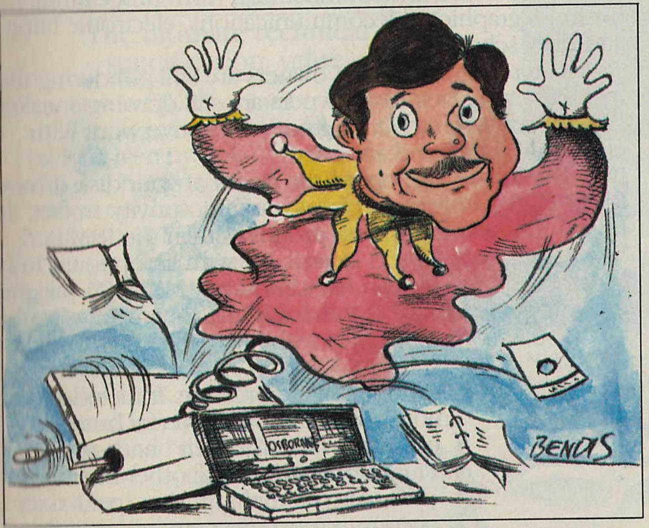
Once the interview has been completed, the students can order a variety of tests, watch a recording of the tests being performed, and get a report on the results. If the students decide that surgery is needed, a recording of an actual operation is shown.

Associate Professor Dr. Abdulla Abdulla, who uses the system in a number of classes, says he likes the way the system develops students' reasoning abilities. "They are forced to think about a diagnosis, they have to think about a test, they have to consider an entire world of possibilities," he says.

The custom-designed computer is based on an earlier model invented by Dr. Fred Weitz, a former student at the college. John Henke, a biomedical engineer, did the programming. The initial version of the system, first used in 1979, was connected to a tape recorder and slide projector. "The results weren't nearly as good as they are with the laser disc," says Abdulla.

Abdulla hopes the system can be adapted to teaching other subjects, both medical and nonmedical. "This system can be used to teach any subject where rules must be followed," he says. ☐

Photographs by Mike Blake



Osborne Strikes Again

Osborne is back! read the buttons at the West Coast Computer Faire. And the statement was true not only for Osborne Computer, the company that ignited the transportable computer trend, but also for its flamboyant chairman and founder, Adam Osborne.

The rise and fall of Osborne Computer has been one of the most controversial stories in the computer industry. The firm was the first to offer a computer, a keyboard, a monitor, two disk drives, and popular "bundled" software all in a transportable package for the then unmatched price of $1795. Kaypro, Compaq, and others followed with transportable computers in the Osborne 1 mold, and bundled software became perhaps the most copied idea in the computer industry.

Osborne Computer's star flew high for a year or two, then plummeted into bankruptcy last summer. You can still trigger a heated argument just by asking ex-Osborne employees what happened. Adam has written his version in *Hypergrowth: The Rise and Fall of the Osborne Computer Corporation* (Idthekkethan, 1984).

Now Osborne Computer has resurfaced with a new management team and a new-old product. The firm shared a booth at the Faire with its user groups and several third-party developers. The highlight of the booth was an IBM-compatible computer installed in the same case as the firm's Executive model. Osborne's announcement of an IBM-compatible Executive II over a year ago—a machine that was never shipped—has been mentioned as one factor in the firm's debacle.

Like the Executive, the new machine includes a pop-down keyboard, two disk drives, and a 7-inch amber monitor. The 28-pound IBM-compatible, now set to be shipped in September, still has not been priced. One thing has been decided, though. The old name has gone the way of most of the company's old plans; the new machine will be known as the Osborne PC.

Osborne's new president, Ronald J. Brown, has filed plans that should have the firm out of Chapter 11 by the end of the summer. Under the plan, Osborne will pay $15.4 million and issue stock to settle total claims of about $45 million. According to Brown, the new Osborne Computer Co. will be a design, marketing, and distribution organization not involved in manufacturing. With other firms building the machines, Osborne will have more control and flexibility, he says.

In addition to the Osborne PC, Brown plans to target other specialized niches, particularly micro-to-mainframe communications, through machines that emulate the VT100 and IBM 3270 terminals. The company plans to continue to sell the $1595 Executive, an 8-bit computer that uses the CP/M operating system and software like Wordstar, Supercalc, CBASIC, MBASIC, p-System, and Personal Pearl. In addition, the company still has a limited supply of the out-of-production Osborne 1, which it is selling for $1,095.

Adam Osborne is still chairman of the company that bears his name, but he is no longer involved in the day-to-day operations. As brash as ever, he is promoting his new software publishing company, Paperback Software International.

Paperback Software hopes to lower the cost of programs to about $50 through a new distribution method. As the name implies, Paperback Software's programs will come in book form and will be sold primarily through bookstores. The new firm falls somewhere in between the traditional software development companies and distribution firms. Paperback Software has signed exclusive distribution agreements with three software development firms and hopes to increase this number to 25 within two to three years. Those companies in turn will design their programs to work with a standard keyboard configuration and file structure, and Paperback Software will distribute all programs in similar packaging.

Osborne compares his plans to orange growers who still run their own businesses but sell the fruit to packaging houses rather than to consumers. "There's no shortage of software today that will do almost anything you want it to do," Osborne says. "Delivery is the problem."

Osborne says his software will be available for any brand of computer with an installed base of 500,000 or more. Today that's limited to the Apple II, the IBM PC and compatibles, the Atari 400/800, and the Commodore 64. Other distributors may sell the programs customized for other machines.

Paperback Software has been in touch with bookstores such as B. Dalton and Waldenbooks and computer stores such as Computerland. And though not all these retail channels have given Osborne a definitive nod, he's optimistic. As always.

—Michael J. Miller

"You go back and work on software."

—BILL GATES, *Microsoft's chairman, when asked what you do after you make the cover of* Time

Illustration by Keith Bendis

In the battle between
the IBM PC, there can be

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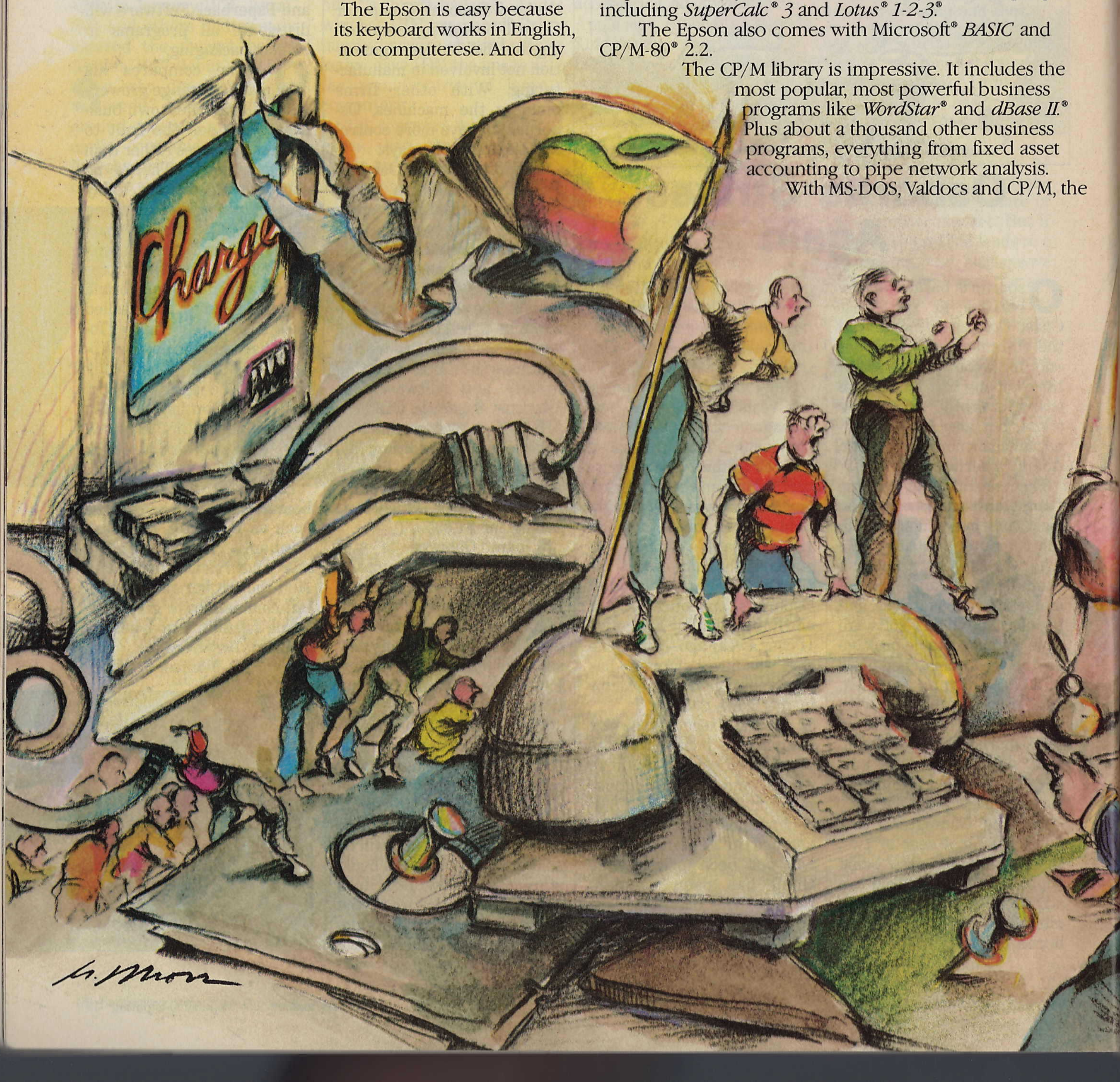

the Apple Macintosh and only one winner. The Epson.

Epson should be able to handle any future business need. And that should make you feel very good about siding with Epson today.

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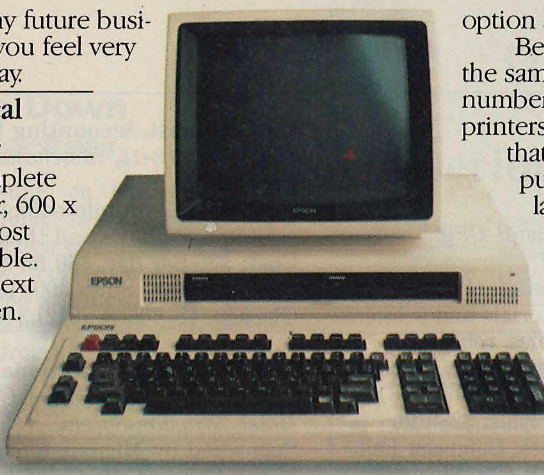
The Epson QX-10 comes complete with a 12″ high resolution monitor, 600 x 400 Pixels, driven by one of the most powerful graphic processors available. With screen resolution this good, text and graphics will leap off the screen. And when you add a graphics program, like *Q-plotter,*™ you can produce presentation graphics of the highest order.

Standard issue on the Epson also includes 256K memory, plus 128K resident video memory, dual 380K Epson-made disk drives, a CMOS Realtime Clock/Calendar with battery backup, a 1-year warranty, an RS-232C port and a parallel port; thus freeing the five—that's right, five—option slots for some real options.

Best of all, everything is Epson quality, the same quality that has made Epson the number one manufacturer of computer printers, worldwide. And when you consider that Epson gives you a complete computer system at a price a thousand dollars less than either Apple or IBM, you understand why this computer can not only bring peace to your desktop, but to your budget, as well.



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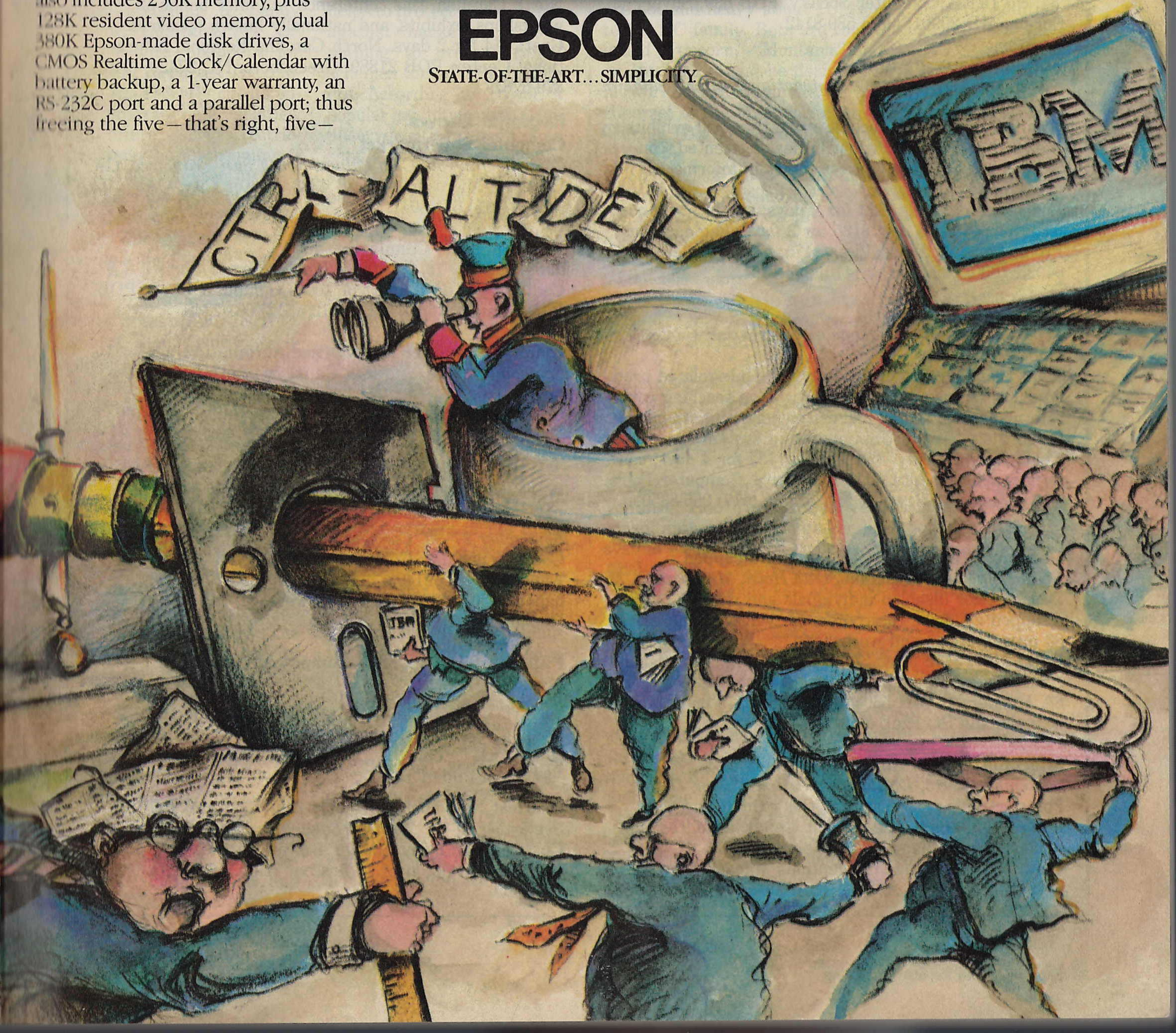


Calendar

National Shows and Conferences

Compcon Fall '84
September 16–20, Hyatt Regency Crystal City, Arlington, VA
Addressing managers, professionals, students, and home users, the conference will include tutorials and sessions on networking, electronic mail, graphics, robotics, computer-aided instruction, and other topics.
Cost: Conference only: $125 for IEEE members; $150 for nonmembers; conference and tutorials: $280 for IEEE members; $350 for nonmembers. Compcon Fall '84, c/o IEEE Computer Society, POB 639, Silver Spring, MD 20901; (301) 589-8142.

National Software Show
September 5–7, Anaheim Convention Center, Anaheim, CA
This trade show will include more than 750 exhibits by over 300 companies. Primarily dealer-oriented, conference sessions will address topics in information management.
Cost: Exhibits only: $25 for 3 days; exhibits and conference: $65 for 1 day, $125 for 3 days. Raging Bear Productions, 21 Tamal Vista #175, Corte Madera, CA 94925; (800) 732-2300 or (415) 924-1194.

Unix Systems Expo/84
September 11–14, Los Angeles Convention Center, Los Angeles, CA
More than 200 vendors will exhibit Unix-related products. Conference sessions will focus on teaching corporate managers, small business owners, and other professionals what the Unix operating system is all about.
Cost: Exhibits only: $20 per day, $35 for 4 days; conference and exhibits: $135 for 4 days. Computer Faire, 181 Wells Ave., Newton, MA 02159; (617) 965-8350.

Special Interest

Computer Technology for the Handicapped
September 13–16, Raddison South Hotel, Minneapolis, MN
Designed for disabled individuals and parents of handicapped children, the conference will offer more than 80 presentations and workshops.
Cost: $150; $175 after Sept. 1; discounts also available. Admission to exhibits only: $3. Closing the Gap, POB 68, Henderson, MN 56044; (612) 665-6573 or in Minneapolis and St. Paul, (612) 341-8299.

Midcon/84 and Mini/Micro Southwest 84
September 11–13, Dallas Convention Center, Dallas, TX
For electronics professionals, this exhibit and conference will emphasize current trends, advances, and applications in many areas of electronics.
Cost: $20. Electronic Conventions Management, 8110 Airport Blvd., Los Angeles, CA 90045; (213) 772-2965.

1984 Midwest Accounting Show
September 12–14, Merchandise Mart Expocenter, Chicago, IL
Exhibits will include equipment and services of interest to accountants and their clients.
Cost: $30 per day, $60 for 3 days. Illinois CPA Society/Foundation, Suite 400, 135 South LaSalle St., Chicago, IL 60603; (312) 346-7957.

North Carolina Educational Microcomputer Conference
September 20–21, Benton Convention Center and Hyatt Hotel, Winston-Salem, NC
Sponsored by Micro-5, a users' group for educators in North Carolina, this conference will offer hands-on workshops, exhibits, and nationally known speakers.
Cost: $14 for 2 days. North Carolina Regional Educational Center, POB 21889, Greensboro, NC 27420; (919) 379-5764.

Regional Shows

Computer Supermarket
September 29–30, Cow Palace, South San Francisco, CA
Cost: $6. Microshows, POB 4323, Foster City, CA 94404; (415) 571-8041.

Heart of Texas Computer Show
September 14–16, Bayfront Plaza, Corpus Christi, TX
Cost: $4 per day. Heart of Texas Computer Show, POB 12094, San Antonio, TX 78212; (512) 681-2248.

Indiana Computer Expo/Office Automation
September 27–28, Indiana Convention Center, Indianapolis, IN
Cost: $3 per day. Trade Show Group, Suite 642, 6100 North Keystone Ave., Indianapolis, IN 46220; (312) 259-1757.

Mid-Atlantic Computer Show and Office Equipment Exposition
September 27–30, Convention Center, Washington , DC
Cost: $5 per day. Compushows Inc., POB 3315, Annapolis, MD 21403; outside MD: (800) 368-2066; Annapolis: (301) 263-8044; Baltimore: (301) 269-7694; Washington, DC: (202) 261-1047.

Philadelphia Area Microcomputer Show and Flea Market
September 22–23, Halloran Plaza Hotel, Rte. 130, Pennsauken, NJ
Cost: $5 per day. Ken Gordon Productions, POB 13, Franklin Park, NJ 08823; (201) 297-2526.

Userfest New York (formerly Applefest and PC '83)
September 20–23, Madison Square Garden, New York, NY
Cost: $10 for 1 day, $20 for 4 days. Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167; (617) 739-2000.

Compuserve Cracks Down on Unscrupulous Hackers

The Compuserve Information Service is finding itself the target of a growing number of unscrupulous hackers. In increasing numbers they are swindling the service and paying customers out of valuable connect time. Things have gotten so bad the system has been forced to take some drastic remedial measures, according to Sandy Trevor, Compuserve's executive vice president for computer resources. The company has recently cut its online programming facilities, and future service restrictions may be forthcoming if things don't lighten up.

"There are a lot of people out there who are intent on using our system without paying a monthly bill," Trevor says. "Some of these people write programs with an intent of breaking our security. One of their favorite techniques is to try to imitate the system's commands." Such programs, he notes, allow hackers to send messages (with sometimes obscene contents) to thousands of subscribers at a time and to learn users' passwords.

In an attempt to protect the system against such mischief, a menu-driven "personal file area" replaced Compuserve's popular "personal programming area" last March. The new menu-driven area restricts a subscriber's options to a list of Compuserve-approved actions, such as storing the contents of an E-MAIL letter or other text document. Unfortunately for legitimate users, the new system has also eliminated access to a variety of useful programming languages, including BASIC, FORTRAN, and Pascal. "The days of programming on Compuserve are gone," says Trevor. "It was a tough decision to make, but we feel the benefits are worth the sacrifice. From now on, users will have to create their programs off-line, although they can still store program listings on the system for other users to download."

But while the new file area helps to protect Compuserve against hackers, it does nothing to prevent rip-off schemes aimed at subscribers. According to Trevor, a popular gambit involves Compuserve's citizens band radio simulator. A hacker engages a legitimate user in what appears to be an innocuous conversation. After gaining the user's confidence, the hacker types a message that makes the user think the system is requesting his password. The password is then noted by the hacker, who can use the purloined account number to trick even more users into divulging their passwords.

"This has been a favorite tactic of system abusers," says Trevor. "Within the past few months we have put up a notice on the CB page warning subscribers of the practice. We have also taken steps to educate new subscribers through our newsletter and other media. It's a difficult process, but we are gaining the upper hand. We just hope we don't have to impose further restrictions," he says.

So far, according to Trevor, customer response has been relatively mild. "I don't think most users mind the restrictions," he says. "When we explain to them that it is for their own protection as well as ours, most subscribers seem to understand." ☐

> **"The [Apple] IIc isn't a home computer. It's for the serious user in the home."**
>
> —JOHN SCULLEY, *Apple president and chief executive officer, at the unveiling of the Apple IIc in San Francisco*

Observations

■ Don't expect IBM to stand idly by as more and more firms enter the PC-compatible market. Rumors are hot and heavy about IBM's new high-end addition to the PC family. Bets are that the machine—variously called "Popcorn," "Montana," and the XTX—will run on an Intel 80286 and be designed for use in multiuser/networking environments, perhaps with a proprietary superset of the Microsoft operating system used on the original IBM Personal Computer.

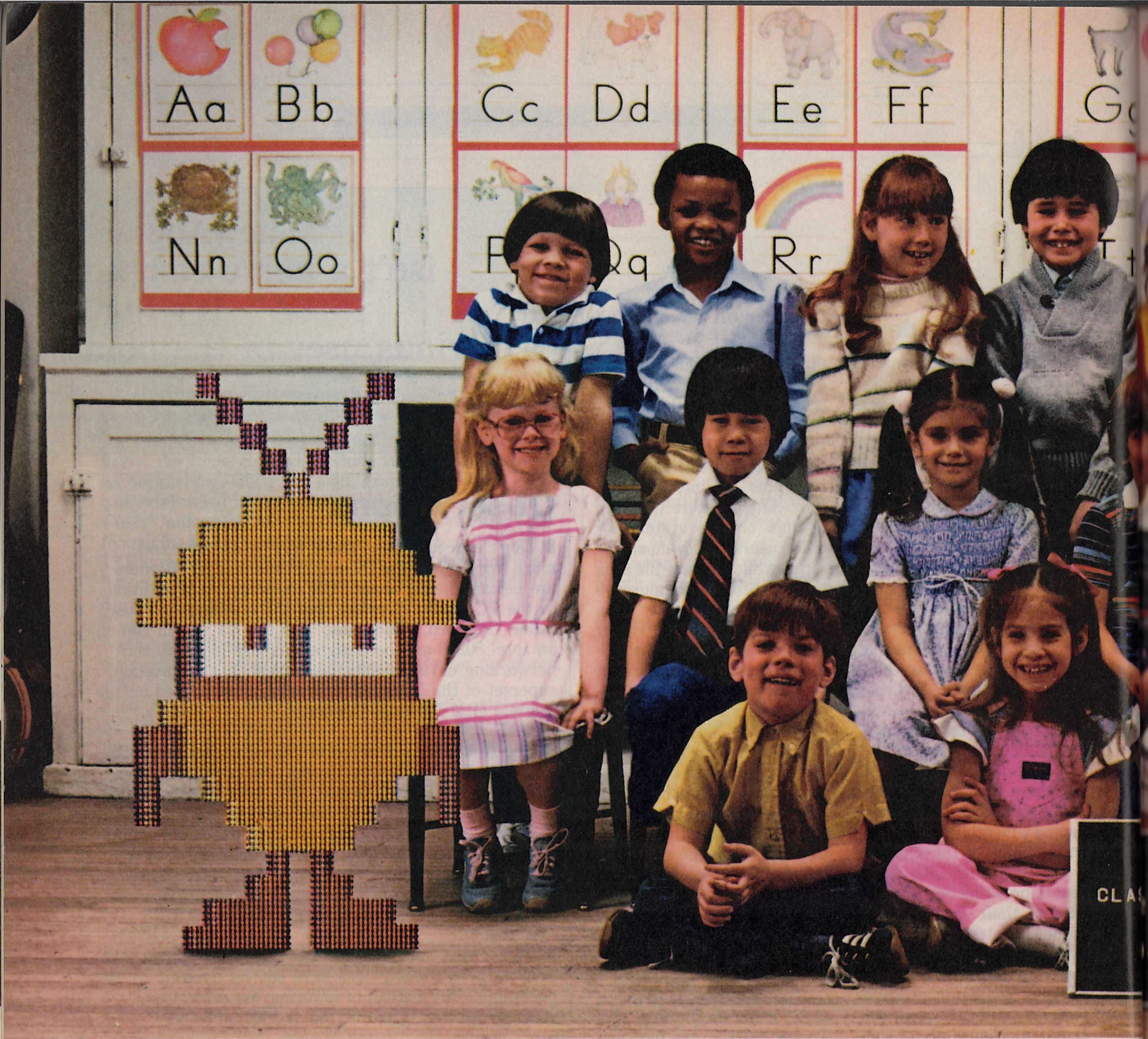
■ The first of a new breed of lower-cost laser printers was recently unveiled by Hewlett-Packard. Known as the Laserjet, the new printer will sell for under $3500, less than half the price of most current laser printers. It can produce text at a rate of eight pages per minute (about 300 characters per second), about six times faster than most letter-quality printers. Several other computer manufacturers, including Apple, are also expected to introduce laser printers this year.

■ Convergent Technologies' Workslate has gained rave reviews, even though sales have not yet lived up to expectations. But instead of lowering the price, Convergent has raised it to $1195, a $300 increase.

■ At a recent Unix Market Forum sponsored by Yates Ventures, Palo Alto, hardware and software firms and consultants debated when—and if—the Unix operating system would ever be truly accepted by consumers. Analyst Jean Yates predicted that IBM's PC/IX implementation would sell about 60,000 copies in 1984. She believes 10 to 15 percent of all personal computers will eventually run Unix.

One current problem is the lack of compatibility between different versions of Unix for microcomputers. Microsoft's Xenix, the current market leader, and IBM's PC/IX are both based on Unix System III, while AT&T is now promoting System V as "the standard." Part of this confusion may end, as Microsoft's chairman Bill Gates has said that Xenix would be made compatible with System V.

Several other factors still need to be addressed before Unix becomes a consumer operating system. The system is still a bit complex—both PC/IX and Xenix come on 19 separate disks.



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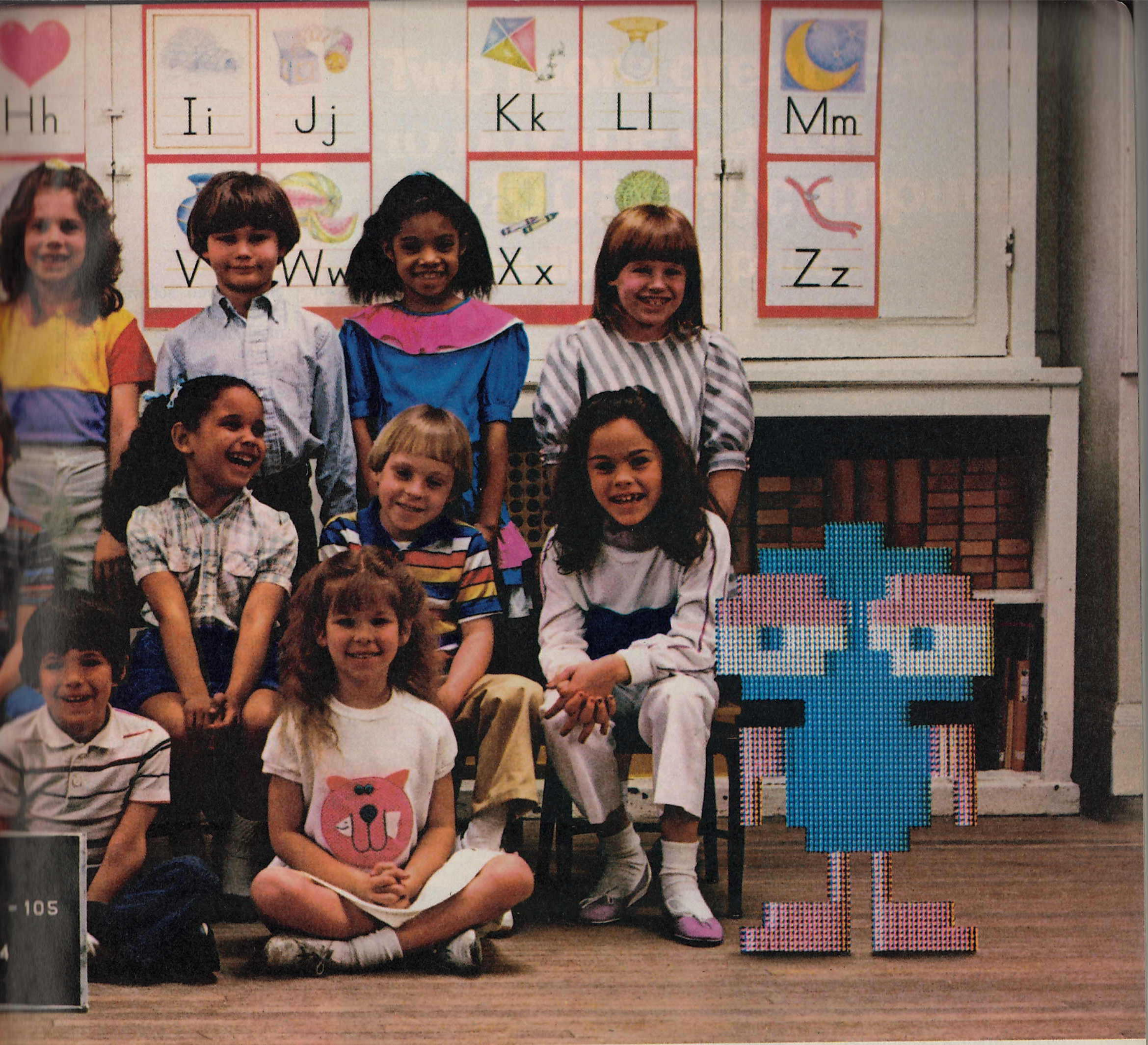

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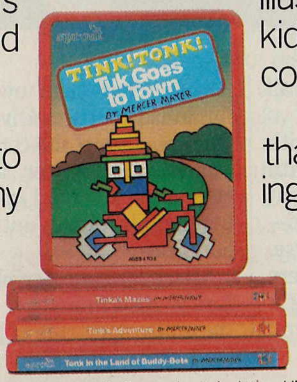

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Feeling Left Out

Ten percent of all micro users share a physical trait that makes computer operation inconvenient and often downright painful. Such diverse personalities as Charlie Chaplin, Leonardo Da-Vinci, Babe Ruth, and former presidents Truman and Ford were also hampered by it. The disability is *sinisterasity*, more commonly known as left-handedness.

While virtually all computer manufacturers boast about user-friendly systems and ergonomically-designed equipment, few pay any attention to the special needs of left-handers. It could be that most of these companies are headed by right-handed people, and the idea that their expertly designed equipment is not ergonomic to all users has never struck home. But to those who are forced to cope with computers designed for right-handers the situation is both dispiriting and frustrating. Here's why.

Disk drives: Without doubt, misplaced disk drives are a left-handed person's biggest headache. All-in-one systems are the greatest offenders. For example, the IBM Personal Computer, Radio Shack's Models 4 and 2000, and the Apple Macintosh all feature drive systems that are located on the machine's right side. Left-handed operators have to bend arms and bodies on a 45-degree angle whenever they wish to swap disks. Ergonomics indeed! A much better method is offered by the Apple II, Commodore 64, and Atari computers. These units use self-contained modular drives that can be placed on either side of the computer.

Keyboards: While traditional QWERTY computer keyboards are inconvenient for all, they pose special problems for left-handed typists. Although manufacturers have little control over the placement of alphanumeric keys, they do have great latitude on locating special-purpose keys. Yet on the Apple IIe, the Delete, Reset, Enter, and cursor control keys are all located on the right side of the keyboard. And on the IBM Personal Computer, the Enter, Insert, Delete, Number Lock, Scroll Lock, Home, and cursor control keys are located on the keyboard's right side. (Let's see left-handed Charlie try to type on that contraption!) On both machines, and on most computers, the Control key *is* located on the left side. But there's a reason for that. Can you imagine right-handed computer users trying to find an alphanumeric key with their *left* hands? Lefties know that problem all too well, only in reverse.

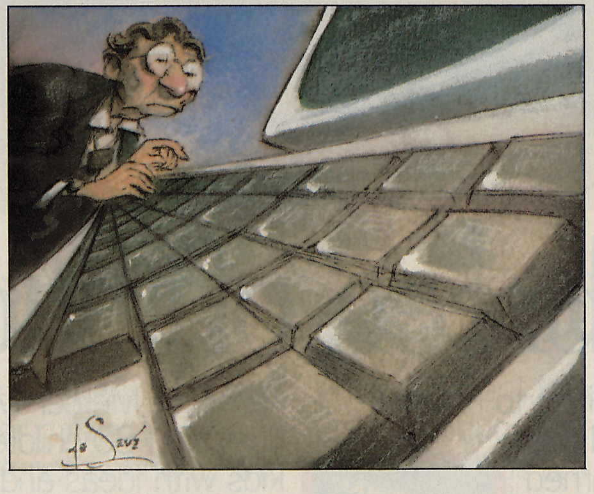

Illustration by Peter deSeve

Numeric keypads: As with disk drives, the problem with keypads is that most are built into the computer keyboard—on the right side, of course. Tallying long rows of numbers on a right-hand keypad is a pain for left-handed users. Probably the best keypad for lefties is the plug-in device Apple offers for its Apple II. A stand-alone unit, this keypad can be placed anywhere on its user's desktop. Lefties laugh every time someone criticizes Apple for not having a built-in keypad.

Controllers: Few input devices are friendly to southpaws. Paddles, joysticks, light pens, trackballs, and mouse units are almost all designed with right-handed users in mind. The biggest problem with these devices is the location of the fire/control buttons. A few manufacturers, most notably joystick makers, are beginning to offer controls with dual buttons, allowing users of either hand preference to operate their units. Single-button mouse controllers are also a step in the right direction. But, by and large, most controllers are nothing less than awkward for lefties to use. Given the current state of the controller industry, computer arcade-type games should give left-handed players an automatic handicap.

Miscellaneous peripherals: Lefty discrimination spans the entire spectrum of peripherals. Even software packages pose special problems, most notably in the area of "touch technology" where menu screens are almost invariably configured for right-handed users.

So what's the solution? Asking manufacturers to produce left-handed versions of all-in-one computers isn't a very economical idea. It would be nice, however, to see computer makers adopt a more modular approach to system design. That way, both left- and right-handed users could arrange their systems in the most convenient manner. It would also allow third party manufacturers to develop system components designed expressly for left-handed users (although why a keyboard manufacturer has yet to introduce a left-handed plug-in IBM keyboard is anyone's guess).

Equipment and software manufacturers need to be made more aware of the problems of lefties. Many of the current design flaws seem more the result of oversight than intentional discrimination. For instance, if the control panels of printers and video displays were located at the center of the unit, instead of at the extreme right side, access would become easy for everyone.

A Call to Action: In the meantime, it's up to left-handed computer users to write letters and make phone calls to people who make computer equipment. Furthermore, if southpaws band together and refuse to purchase products that blatantly discriminate against left-handed users, they may be able to change some minds. After all, 10 percent of the market is a sizable number of computer users.

Left on!

—John Edwards

John Edwards is *Popular Computing*'s only left-handed contributing editor.

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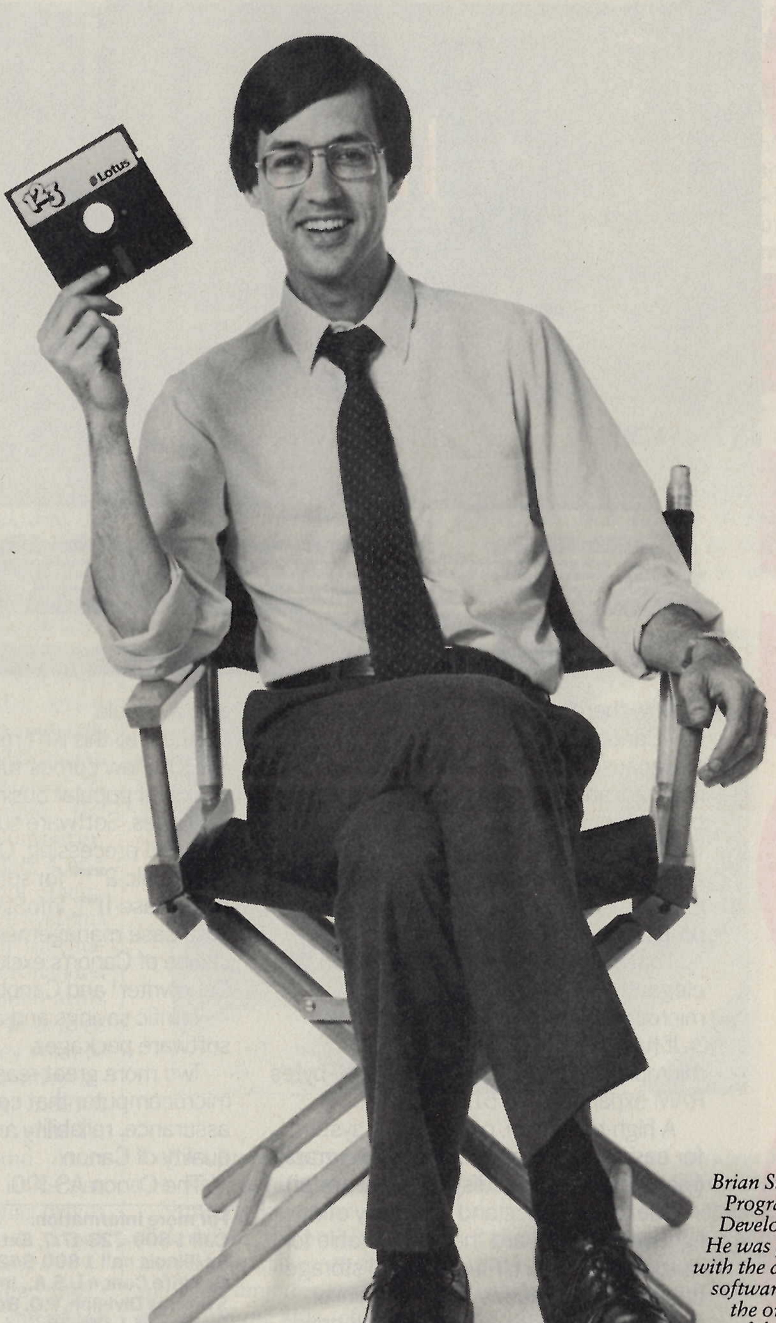
Canon Systems Division

Circle 11 on inquiry card.

"You asked for an encore.



Brian Stains is the Symphony Program Manager at Lotus Development Corporation. He was previously involved with the creation of 1-2-3 software and is one of the original members of the company.

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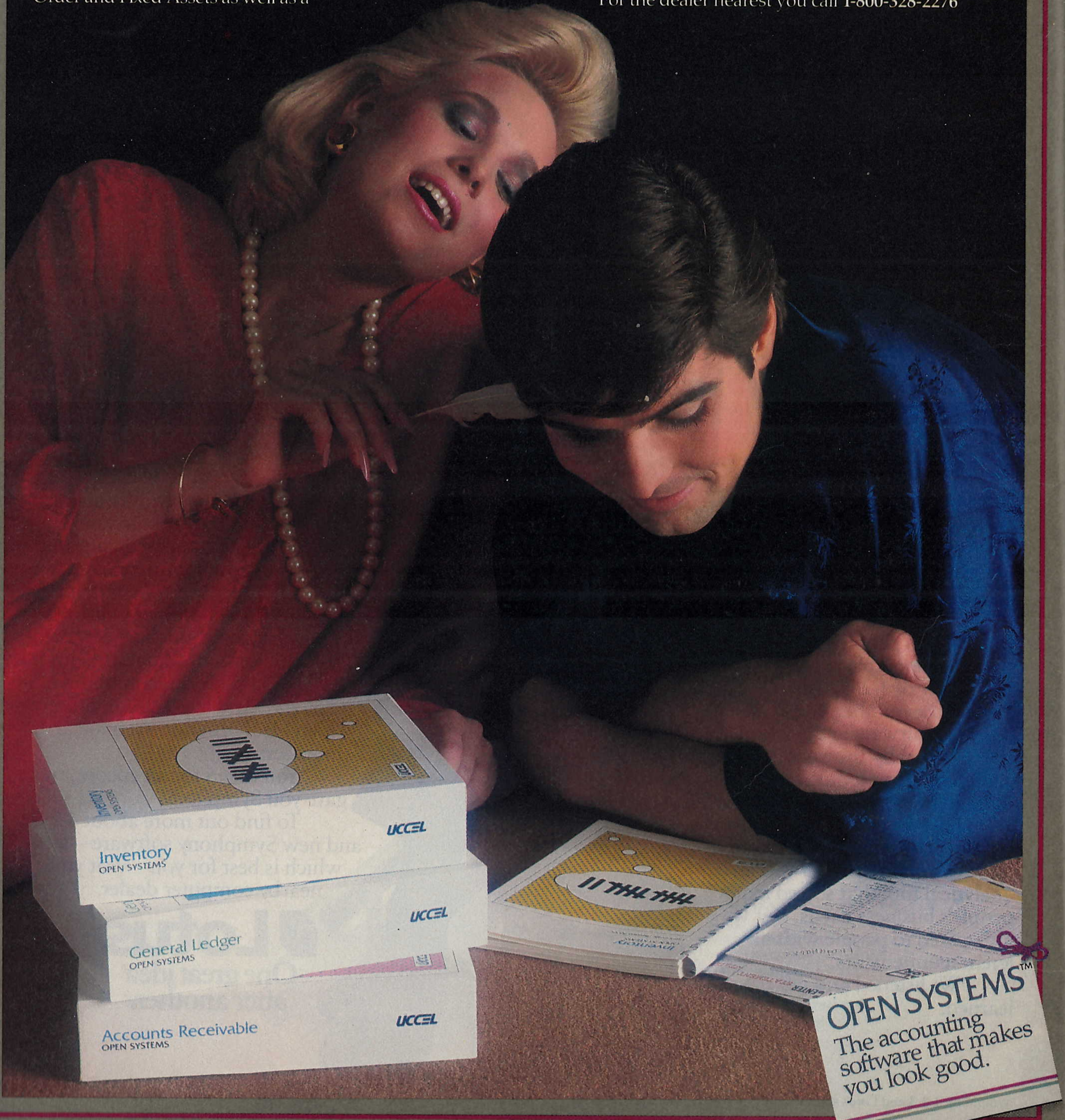

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What's in a Name?

Almost everything, as marketing becomes the biggest priority

by Steven Levy

I saw a strange ad in a trade publication the other day. On one side of a page was a picture of Joan Crawford in her glamorous days before she made horror films and before we all knew she beat her kids because they used wire coat hangers. On the facing page, there was text headlined "Lucille Le Sueur made a name for herself." The rest of the ad copy reasoned that since Joan Crawford (who, of course, was born Lucille Le Sueur) changed her name, it was only logical that this company placing the ad—Soft-Word Systems—was changing its name to MultiMate, which is also the name of the company's successful word processor.

"A star needs a star's name," the ad read. "One that commands attention. And gets it." This all built up to the last paragraph of the ad, which began by intoning the company's new name in a sentence all by itself: "MultiMate International. It's the name we deserve. Because it's the name we've earned."

There is much to ponder here. Putting aside the baffling question as to what kind of person's blood runs hot at a stupefying moniker like "MultiMate International," I think the ad is indicative of how important the names of products and companies in the computer world have become. It used to be that all a computer company really had to do was call itself by its initials and call its products by a bunch of numbers. Thus we had computers named 709 and PDP-1, software products named DECAL and Mark IV, and companies called DEC and IBM. Certainly that route has not hurt the latter company. I doubt if you will ever see an ad reading, "IBM is a good name but no longer reflects the company we've become."

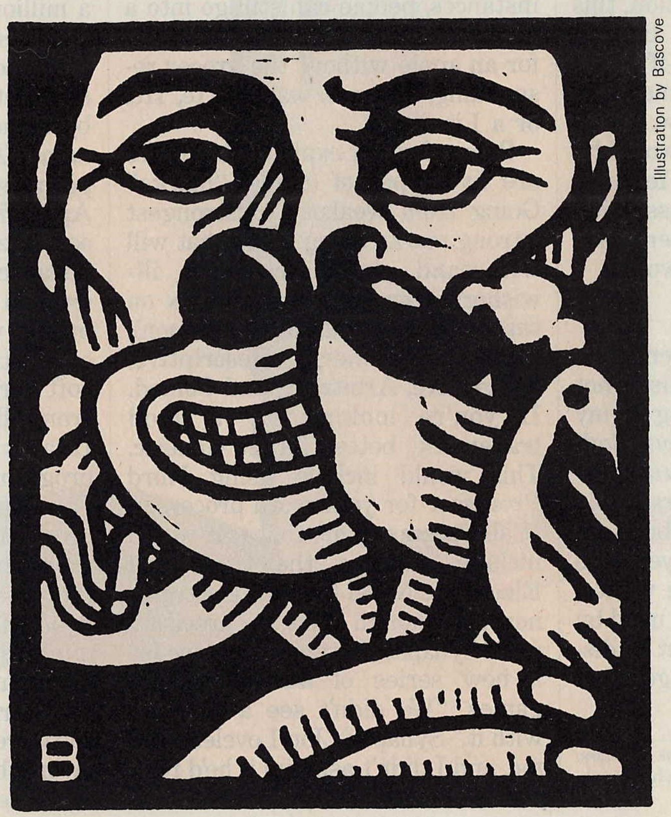

Illustration by Bascove

Getting a Competitive Edge

Yet if IBM were starting out today, I think it would realize that the modern computer business calls for something more. Competition is tough, and a name can provide an edge. There is a mythological, almost mystical, power to names. The very texture of a name can affect our thinking about something. There have been studies indicating that a person's name affects character. Are Emilys studious? Do Biffs invariably turn out to be jocks?

Then there are the possessive aspects of claiming a name. Some cultures believe that when a person names something, he or she owns it. Our culture does not accept that notion. We put an additional premium on owning the name itself. So when someone officially registers a name, he, she, or it (in the case of a corporation) has a monopoly on commercial uses of the word.

Odd, isn't it, the concept of owning a word? Especially when it is a word that people have used for years without even thinking that "this word is property of so-and-so, and unauthorized use will lead to summary execution by way of deadly exposure to litigious prose."

Take something as simple as "apple." A fruit, right? According to the Oxford English Dictionary, that name has been applied to the "round firm fleshy fruit of a Rosaceous tree" since its first recorded use in the year 885. Yet when you uppercase that word's first letter, you get Apple, the name of a record company formed by the Beatles. Oh yes, and also a computer. Some people think that the very name Apple was as much a factor as any in making the computer the huge success it was and is. As the story goes, Steve Jobs used to work in an orchard and liked apples. Ergo Apple. And now Apple Computer Inc. owns the word in a certain respect.

Some people think the very name Apple was as much a factor as any in making the computer the success it is.

It is a tangled legal situation, this business of owning words. But it's certainly not insignificant—if Apple were to lose its name, or some other company were given license to call its computer Apple, there would be a furor raised in Cupertino. Yet what did Apple do to get legal possession of a word that for eleven centuries has been . . . a household word?

The Trademark Tangle

To claim a word for your very own, you must trademark it. This is not so simple. I'll explain, using as my source *Legal Care for Your Software: A Step-by-Step Guide for Computer Software Writers* (Nolo Press, 1983), an excellent book by Daniel Remer, a rare lawyer who knows what English is. He writes, "A trademark is a word . . . used by a manufacturer or merchant to distinguish his goods from the goods of others."

But, says Remer, it's not that easy. For instance, if you come up with a nifty new word processor, you can't simply call it "Word Processor." That's too generic and describes everything else in the field. It would be nice if everyone who came into a computer store and asked for a word processor got your product, but even the government considers this unfair. However, if you're in a field other than computers and software, you could use it.

Let's say you're a food scientist and you develop a new kind of rice. You can call that strain of rice "Word Processor," though why in hell you would do that is beyond me. But no one is going to confuse rice with Visiword (except maybe a few disgruntled users). That's why Apple can get away with appropriating that word; even though Apple has a legal claim to the word in some instances, people can still go into a grocery store and with impunity ask for an apple without the grocer responding, "Do you want a IIe, IIc, or a Lisa?"

Remer further explains that there are five types of (trade) "marks." Going from weakest to strongest (strong marks being those that will withstand challenges from ill-wishers, who often seem to fix on this issue as an offensive weapon), there are Generic, Descriptive, Suggestive, Arbitrary, and Coined. If you're looking for a good trademark, better forget Generic. This would include using Word Processor for your word processor. It also seems to me that this would include claiming the trademark Electronic Novel for your electronic novel, although that is precisely what Synapse Software has done for a new series of adventure-style games. "We didn't see a problem with it," Synapse's Jon Loveless told me, and I didn't ask him if he'd read Remer's book.

Remer calls a mark Descriptive if it describes the product or company but has another meaning in the public's eye besides the word (or words) itself. More distinctive is a Suggestive mark—he uses Easywriter as an example—which supposedly just *implies* something about the product and is stronger than the purely Descriptive mark. (Remer admits it's sometimes hard to make these distinctions, but that's what lawyers are for, I guess.) Arbitrary marks are real words whose dictionary meanings don't have anything to do with the product—Apple is an example. And then the strongest of all, a Coined mark, where you actually invent a word and then blitz the public until it knows to identify this new word with your company or product.

In all cases, though, you have to make sure no one has gotten there first, and you do that by a trademark search. Many a brilliant name has gone by the wayside in that process, which isn't foolproof—often you'll find that some little company holds title to the name you've just spent a million dollars promoting.

It seems that everyone in the computer industry was gloating over speculation that Coleco got snared by some little company using the name "Adam" for its product; it is perhaps less well known that when Apple finally decided to use the not-so-secret code name Lisa for that advanced 68000 machine, it discovered to its dismay that the trademark was owned by another computer-related company, the software firm Sierra On-Line. Ironically, Sierra On-Line was using Lisa as the name of an assembler program for, of all things, the Apple II computer. The author of the program, Randy Hyde, preferred to pronounce the name as Lie-za, though it was spelled the same way Apple had planned to spell it on its much-ballyhooed roll-out day. Fortunately for Apple, the president of Sierra On-Line, the 28-year-old software wizard Ken Williams, was favorably disposed toward the big firm. He let Apple use the name, he

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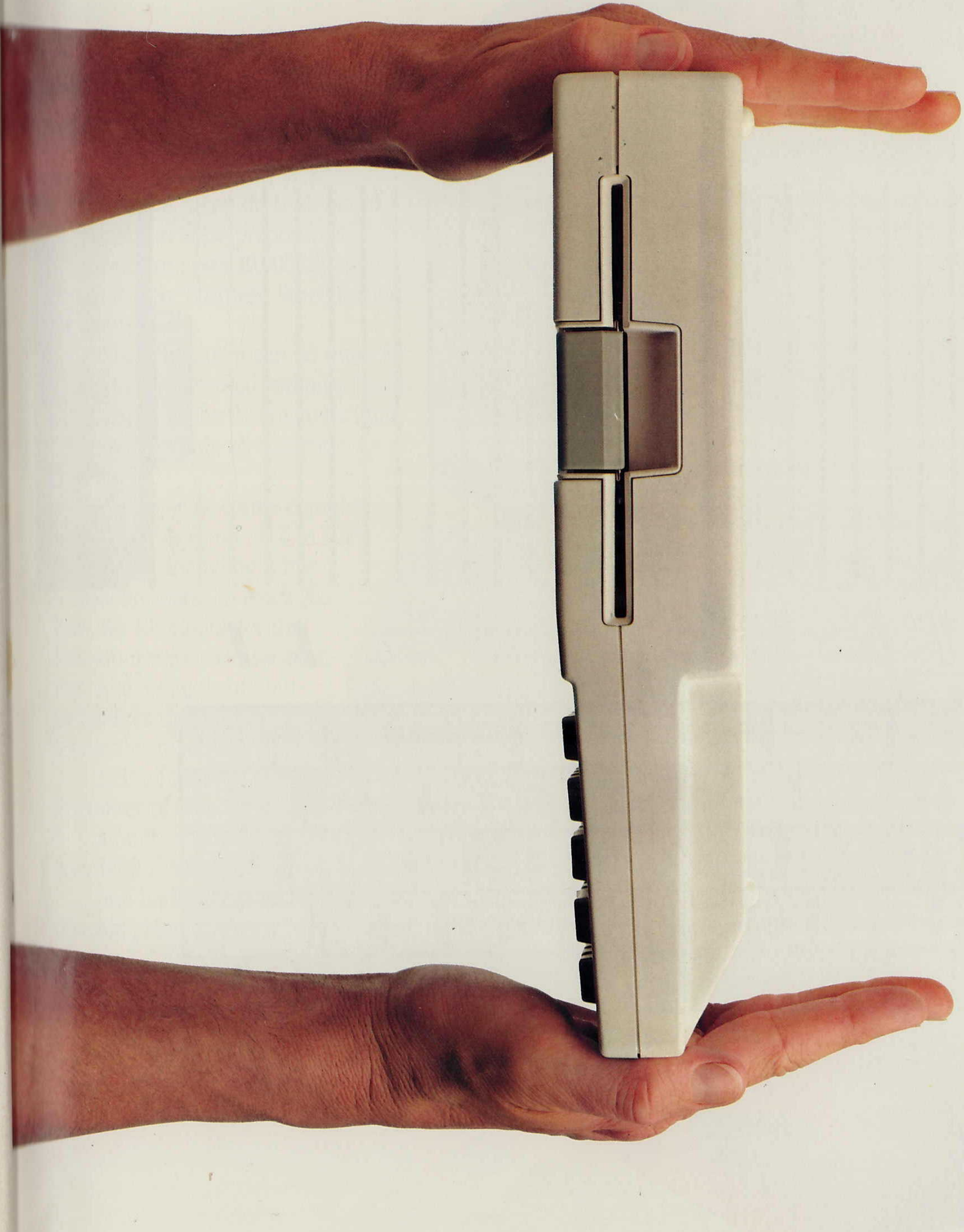
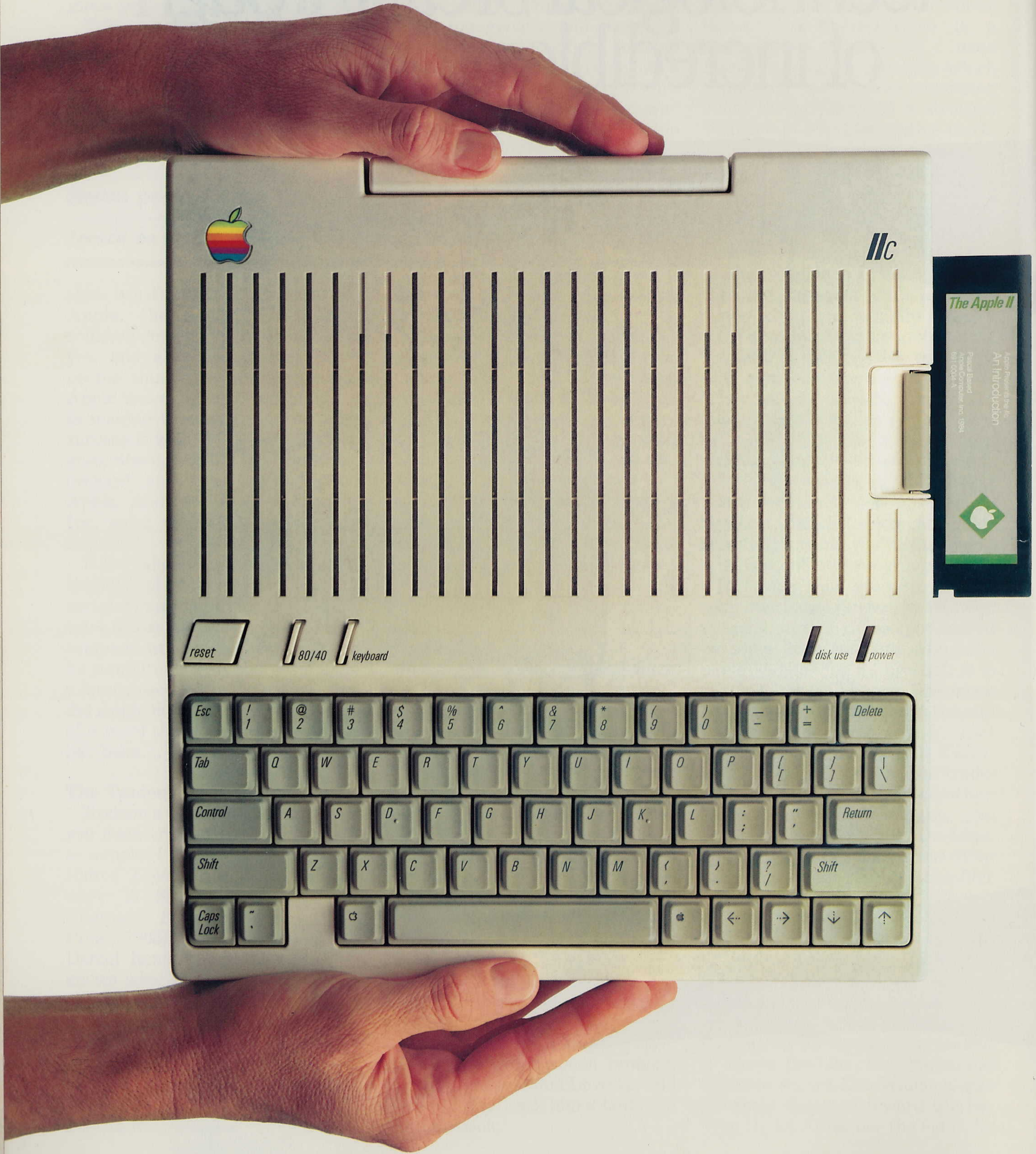
Contributing editor Steven Levy's book *Hackers: Wizards of the Computer Revolution* is being published this fall by Doubleday.

Apple announces a technological breakthrough of incredible proportions.



12" x 11¼" x 2¼."


IIc
reset
80/40
keyboard
disk use
power
The Apple II
An Introduction

Introducing the Apple IIc.

The new Apple® IIc Personal Computer.

It's about the size of a 3-ring binder.

It weighs less than 8 pounds.*

And costs less than $1,300.**

Yet what it can do is all out of proportion to these proportions:

It can run over 10,000 different programs. For business. For education. Or just for fun.

Which means it can do more for you than any personal computer by any other name. Or, for that matter, initials.

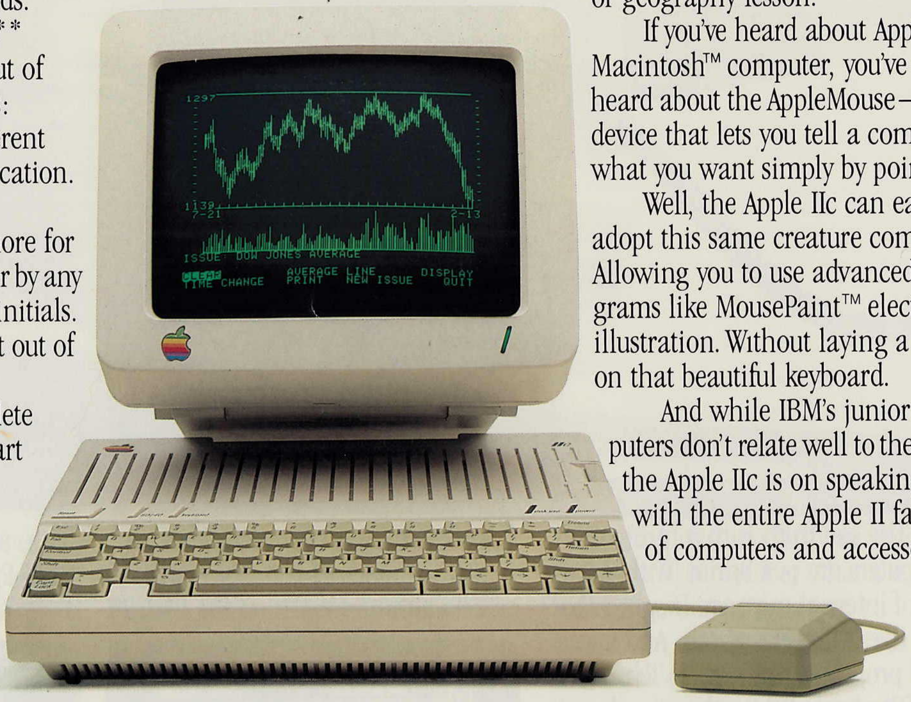
And it can do all that right out of the box.

The Apple IIc comes complete with everything you need to start computing. Including a free 4-diskette course to teach you how. An RF modulator that lets you use your TV as a monitor. And a gaggle of built-in features that cost extra on less senior machines:

128K of internal memory—twice the power of computers twice its size.

A built-in disk drive that could cost $400 if it weren't.

And built-in connections that let you add printers, phone modems and an extra disk drive without adding $150 goodies called "interface cards."



Its full size keyboard is as ergonomically perfect as an IBM® typewriter's. Which is a lot more than computers by the same name can say.

With full 80-character display capabilities, it can show you more at once than smaller-minded computers.

And with 16 ultra high-resolution colors, it can bring any presentation to life—whether it's a quarterly report or geography lesson.

If you've heard about Apple's Macintosh™ computer, you've also heard about the AppleMouse—a little device that lets you tell a computer what you want simply by pointing.

Well, the Apple IIc can easily adopt this same creature comfort. Allowing you to use advanced programs like MousePaint™ electronic illustration. Without laying a hand on that beautiful keyboard.

And while IBM's junior computers don't relate well to their elders, the Apple IIc is on speaking terms with the entire Apple II family of computers and accessories.

A family known for, among other things, advanced technology, iron-clad reliability and the world's largest library of software.

All of which makes the Apple IIc much bigger than it looks.

*Main unit only. **Suggested retail price.*

The first transportable computer worth taking anywhere.

The sad truth is that most small computers are pea brains. With 8 to 16K of internal memory. Displays that look like a jogger's watch. And fewer good programs than Radio Tehran.

The Apple IIc, on the other hand, has more brains and talent in its 7-1/2 pound body than you'll find in some full-size office computers.

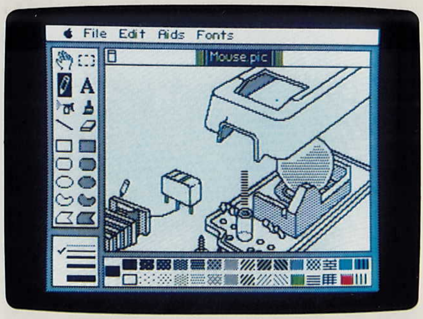
It can run a vast library of Apple II software. Over 10,000 programs.

With a full 128K RAM, it can run advanced business software. Like AppleWorks, a 3-in-1 program that integrates word processing, electronic filing and spreadsheets.

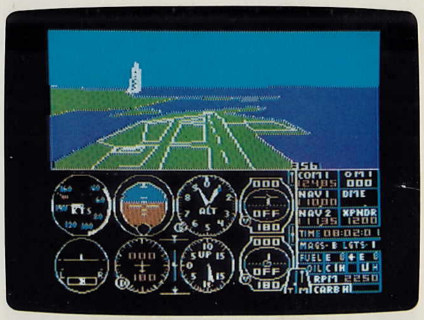
And even as we write this, seventy-nine leading software companies are writing new programs for the Apple II family. Including software that takes full advantage of the AppleMouse.

As a matter of fact, the Apple IIc can do almost everything the IBM PC can, and thousands of things the IBM PCjr can't.

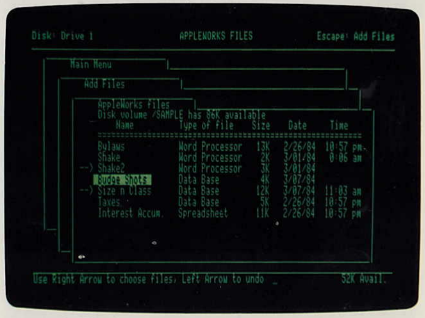
You can add an extra disk



MousePaint Electronic Illustration



SubLogic's Flight Simulator II



```
Disk: Drive 1            APPLEWORKS FILES            Escape: Add Files

  Main Menu
    Add Files
      AppleWorks Files
      Disk volume /SAMPLE has 86K available
         Name            Type of file    Size   Date     Time
      =========================================================
      Bylaws             Word Processor   13K  2/26/84  10:57 pm
      Shake              Word Processor    2K  3/01/84   0:06 am
  --> Shake2             Word Processor    3K  3/01/84
      Budge Shots        Data Base         4K  3/07/84
  --> Size n Class       Data Base        12K  3/07/84  11:03 am
      Taxes              Data Base         5K  2/26/84  10:57 pm
      Interest Accum.    Spreadsheet      11K  2/26/84  10:57 pm

Use Right Arrow to choose files, Left Arrow to undo _          52K Avail.
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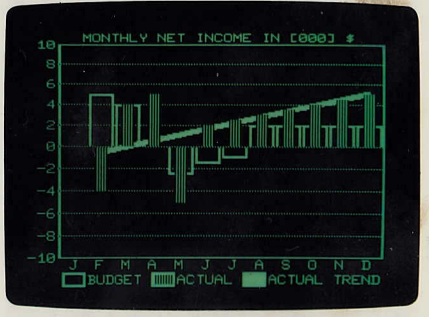
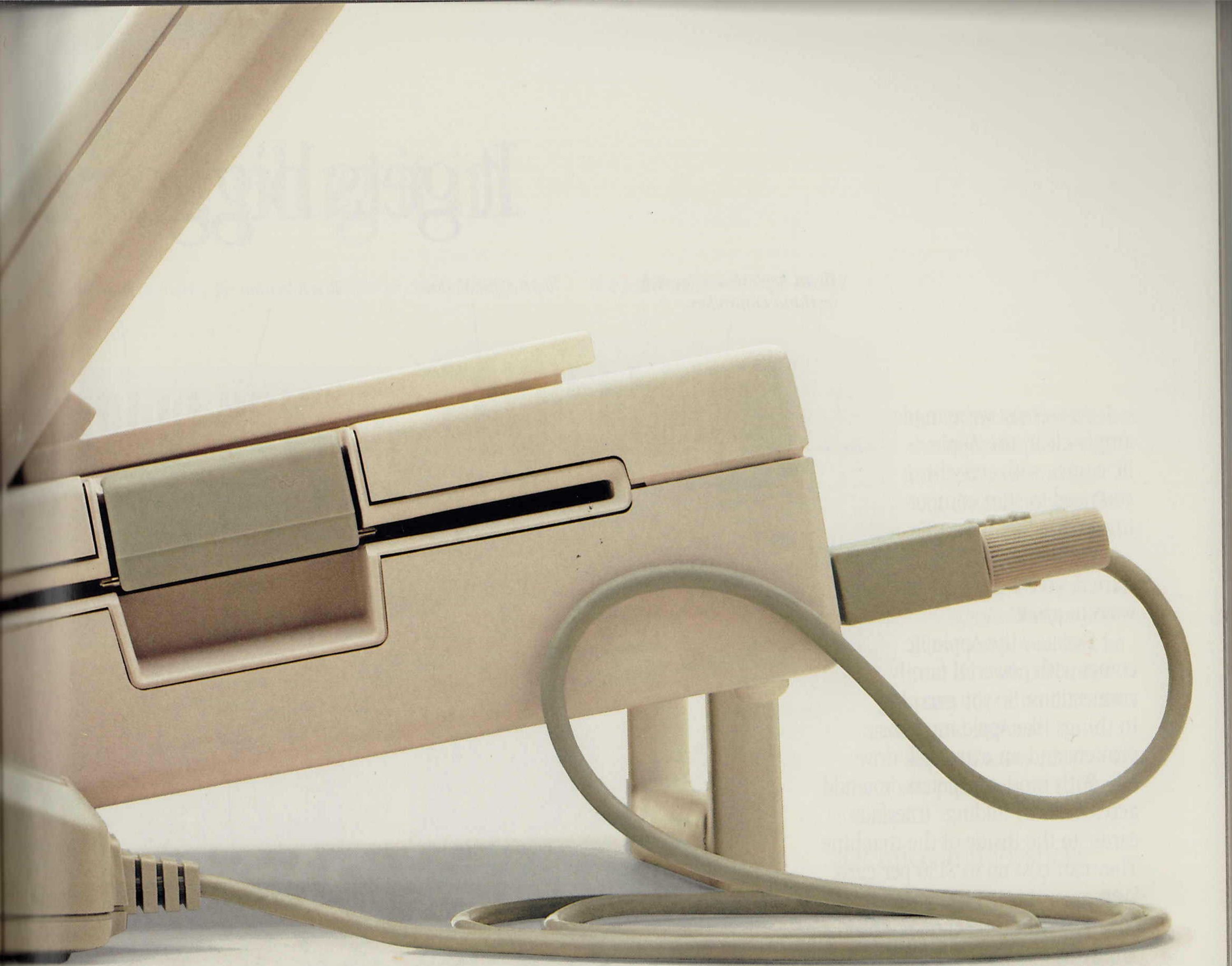
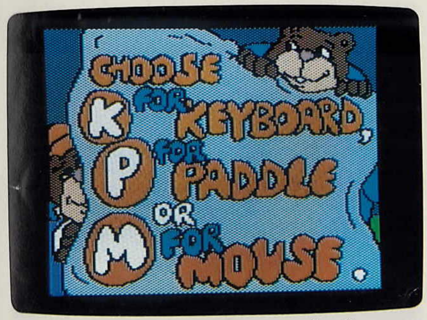
AppleWorks Integrated Business Software



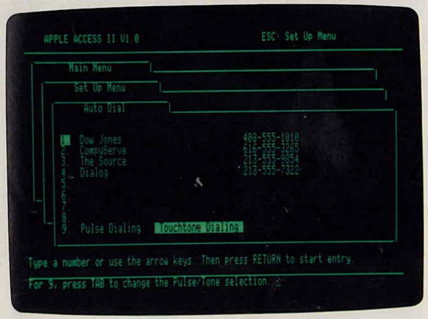
Dollars & Sense™ Personal Finance



drive so you can run advanced business software for accounting, payroll and taxes.



Stickybear Shapes™ Educational Software



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APPLE ACCESS II V1.0                    ESC: Set Up Menu

   Main Menu
    Set Up Menu
     Auto Dial

 1. Dow Jones                        408-555-1010
 2. CompuServe                       616-555-3265
 3. The Source                       213-555-9854
 4. Dialog                           213-555-7322
 5.
 6.
 7.
 8.
 9. Pulse Dialing    Touchtone Dialing

Type a number or use the arrow keys. Then press RETURN to start entry.
For 9, press TAB to change the Pulse/Tone selection.
```

Access II Communications Software

Not to mention specialized software for doctors, lawyers, contractors, farmers, brokers, screenwriters and just about every other profession that's legal.

And, of course, since the Apple II is the most popular computer in all levels of education from grade school to graduate school, the Apple IIc can run more educational software than any other computer in the world, save one—the Apple IIe.

Which makes the IIc the only computer that's as good for your kids as it is for you. And vice versa.

In fact, an Apple IIc can do everything you'd ever need a computer to do, sitting happily on your desk at work or at home.

But if someday you need it to do something in some faraway hotel room, you'll remember what a superb traveling companion it can be.

It can use almost any TV for a monitor—even a hotel TV.

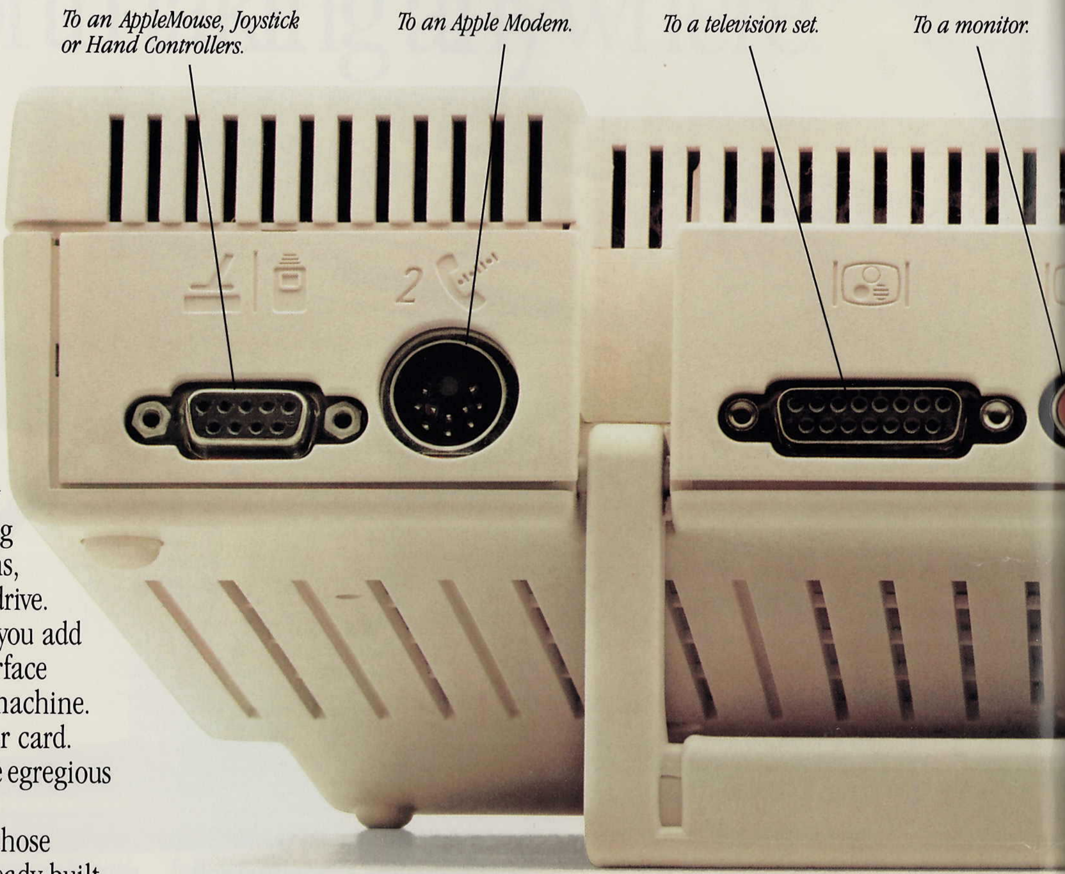
Or you can add an Apple IIc Flat Panel Display†—the very first LCD display that shows you as much information as a regular monitor—80 characters wide by 24 lines deep.

And when your work day is done and you're all alone far from home, it can do one more thing no other portable computer can do.

Play Zaxxon.™

†*Available Fall 1984.*

It gets bigger wh



As we trust we've made amply clear, the Apple IIc comes with everything you need to start computing in one box.

But once you've started, you've got a lot of ways to grow.

Because the Apple IIc comes with powerful family connections. So you can plug in things like Apple modems, printers and an extra disk drive.

With most computers, you add accessories by adding "interface cards" to the inside of the machine. They can cost up to $150 per card. Even more if you make some egregious error installing the card.

With the Apple IIc, all those expensive interfaces are already built in. So you never have to risk messing around inside the computer—it's a sealed system. And the symbols on the back of the machine tell you exactly what goes where.

Which makes growing your system about as difficult as plugging in a toaster.

And which makes outgrowing it virtually impossible.

Displays of graphic power.

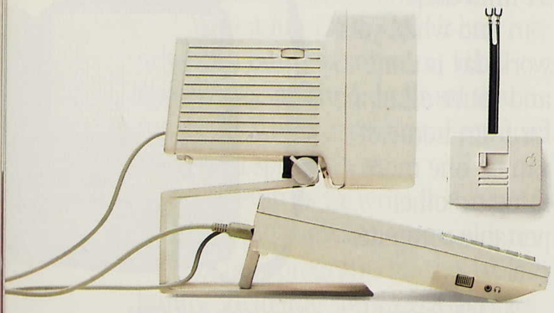
The IIc comes with an RF modulator that turns any garden variety TV into a computer monitor. But you'll get a better picture with one of these:

The Apple IIc 9" Monitor—high resolution green phosphor display that's a perfect match for the IIc aesthetically as well as technically.

The Apple IIc Flat Panel Display—the first LCD display that shows you as much as most regular monitors: 80 characters by 24 lines.

Miracles of reproduction.

The IIc can drive virtually any serial printer on the market—including letter

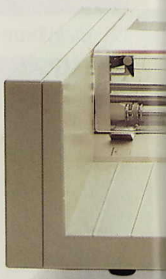


Apple IIc 9" Tilt Screen Monitor

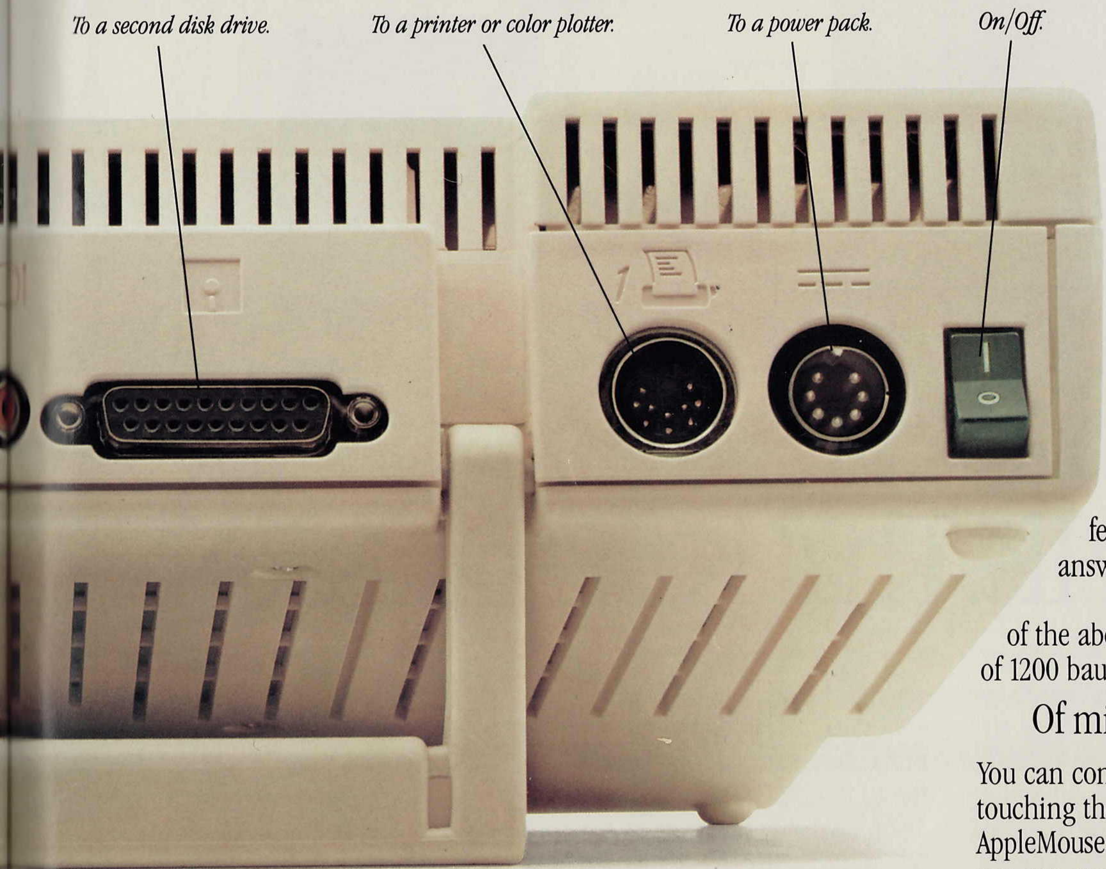
RF Modulator

Flat Panel Display

Scribe Printer
Imagewriter



en you plug it in.



quality for serious business. But we offer two IIc printers and a color plotter that offer you a lot more graphic flexibility:

Scribe—Apple's first ultra low cost quality color/b&w printer. Works with any kind of paper, from bond to plain brown wrappers.

Imagewriter—Apple's high quality printer reproduces most anything you can put on the IIc's screen.

Color Plotter—Apple's incredibly compact wide bed plotter generates all kinds of graphics and illustrations in 8 brilliant colors.

Reach out and beep someone.

Your Apple IIc can give you a direct line to the world. Bank at home, find the lowest air fares, follow the stock market, even buy software and have it sent directly to your IIc—all over the phone. And to do all that, all you need is one of these:

Apple Modem 300—a low cost phone link for your IIc with advanced features like auto dial, auto answer and self-test.

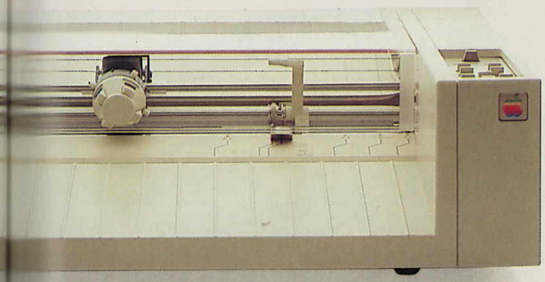
Apple Modem 1200—all of the above plus high speed mode of 1200 baud.

Of mice and joysticks.

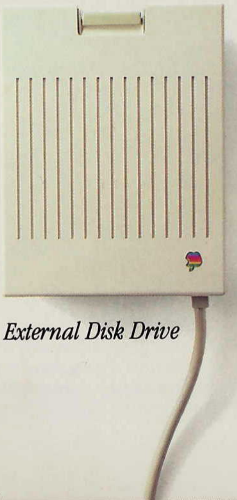
You can control your IIc without even touching the keyboard. With the AppleMouse and MousePaint software, you can create impressive electronic illustrations in color.

The AppleMouse—Replaces complex keyboard commands with point-click-cut-paste simplicity. Comes with free MousePaint program.

The Apple IIc Joystick—a game controller that's also used for many educational programs and music composition.

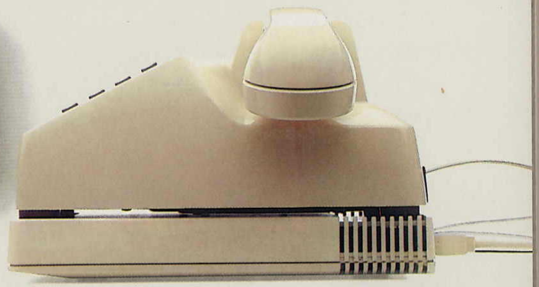


Apple Color Plotter

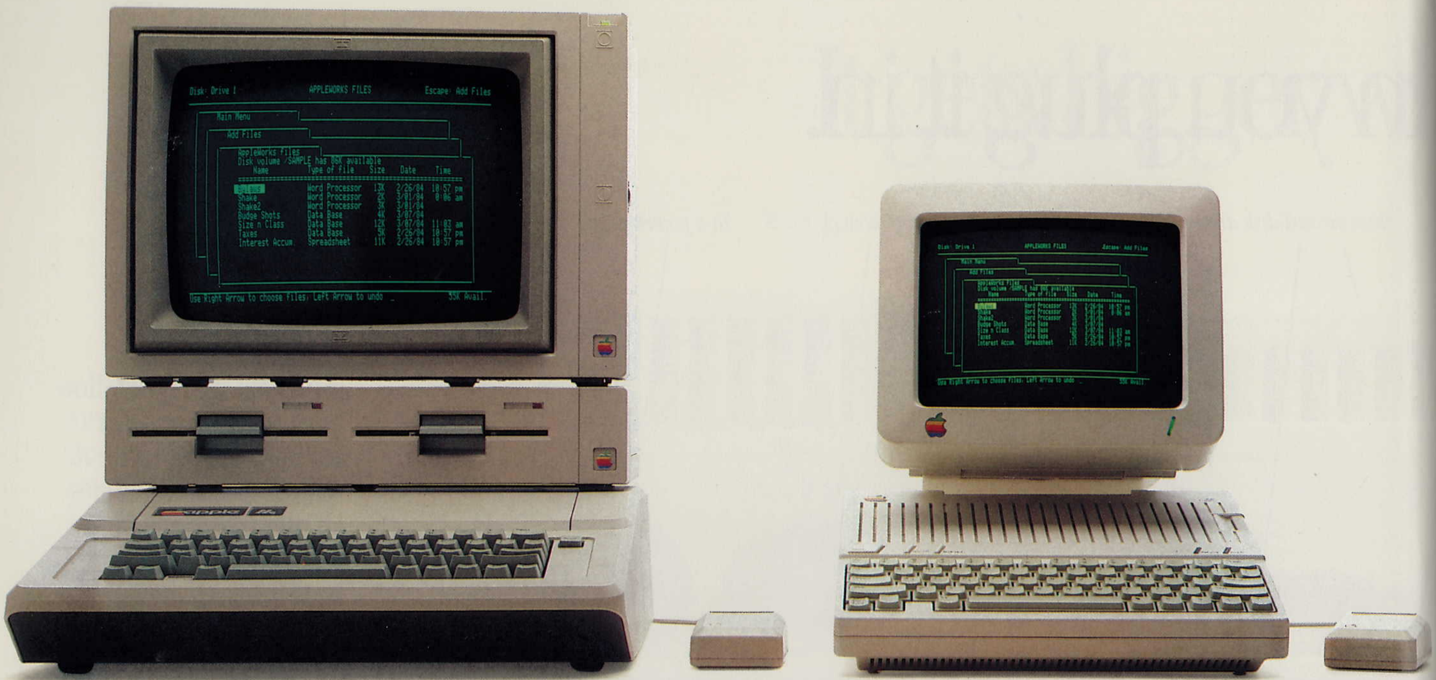


External Disk Drive

AppleMouse



Apple Modem 300/1200



IIe or IIc. That is the question.

We've spent the last seven pages giving you lots of good reasons to take home an Apple IIc.

But we don't want you to forget that our newest brainchild isn't an orphan.

Its father, the Apple IIe, happens to be the granddaddy of the entire personal computer industry.

Unlike we humans, it gets more flexible, more powerful and more innovative every year.

It can run more software than any other personal computer in the world.

There are also more accessories and peripherals for the Apple IIe than for any other personal computer in the world.

You can expand its memory to an elephantine 512K.

You can add a ProFile™ hard disk that can store up to 2400 pages. Room for all the files of a small business. Or an unabridged history of Armenia.

In fact, you can expand the Apple IIe to do just about anything you can imagine:

Run a lab-full of test equipment. Control a basement-full of mainframes. Load the Space Shuttle. Give industrial robots their marching orders. Converse with dolphins. Even run IBM software.

So the only question is which II you need more:

An incredibly expandable Apple II. The IIe.

Or an incredibly compact Apple II. The IIc.

Your authorized Apple dealer will be happy to help you decide.

S/he can also help you take home your choice for as little as 10% of the purchase price. All you have to do is qualify for an Apple Credit Card.

If you haven't committed any heinous crimes lately or otherwise proved yourself a total flake, you can get one.

In about the time it'll take you to make up your mind.

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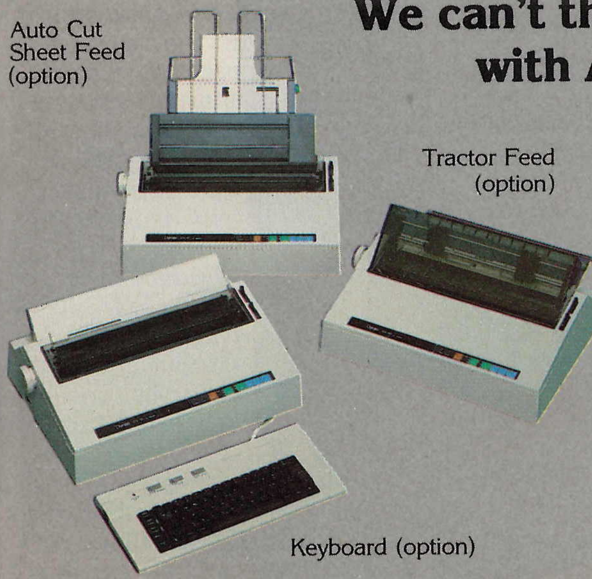
WE ALL AGREE



We can't think of anyone who isn't better off with A DX-15 DAISY WHEEL PRINTER.

Dynax's DX-15. And if you want the kind of printer that lives in the fast lane, the DX-15 is your printer. It does it all, certainly all that far more expensive models can do. The DX-15 offers you some important options like Keyboard, Tractor Feed and Auto Cut Sheet Feed. Not only that, the DX-15 is a very durable unit, be it for business, home or word processing applications. And who says a great printer has to be expensive? Not us! What we say is you'll be dumbfounded when your dealer tells you just how inexpensive the DX-15 happens to be. Give him a call or drop by. Dynax's DX-15 says it ALL. Circle 30 on inquiry card.

Dynax™, Inc.

6070 Rickenbacker Road,
City of Commerce, CA 90040,
213-727-1227

Offices: (NJ) 201-471-0100 / (TX) 214-257-1700 / (IL) 312-981-5633 / (MA) 617-933-8162 / (N.CA) 408-730-1712.

Somebody has to be better than everybody else.

It's inevitable.

Somebody is always more determined. Works harder. And winds up on top.

Take Dysan, for instance.

We were the ones who helped develop the first 5¼″ flexible diskette.

And while everybody else was trying to figure out how to make them, we were busy making them better.

With superior materials. A special lubricant and jacket liner that extend diskette life.

Unique manufacturing techniques. Like our burnishing process that helps eliminate read/write errors.

And an almost fanatical corporate commitment to quality.

What does all this mean to you?

Every Dysan diskette you buy will record and retain all your data all the time. For as long as you own the diskette and treat it right.

Dysan.

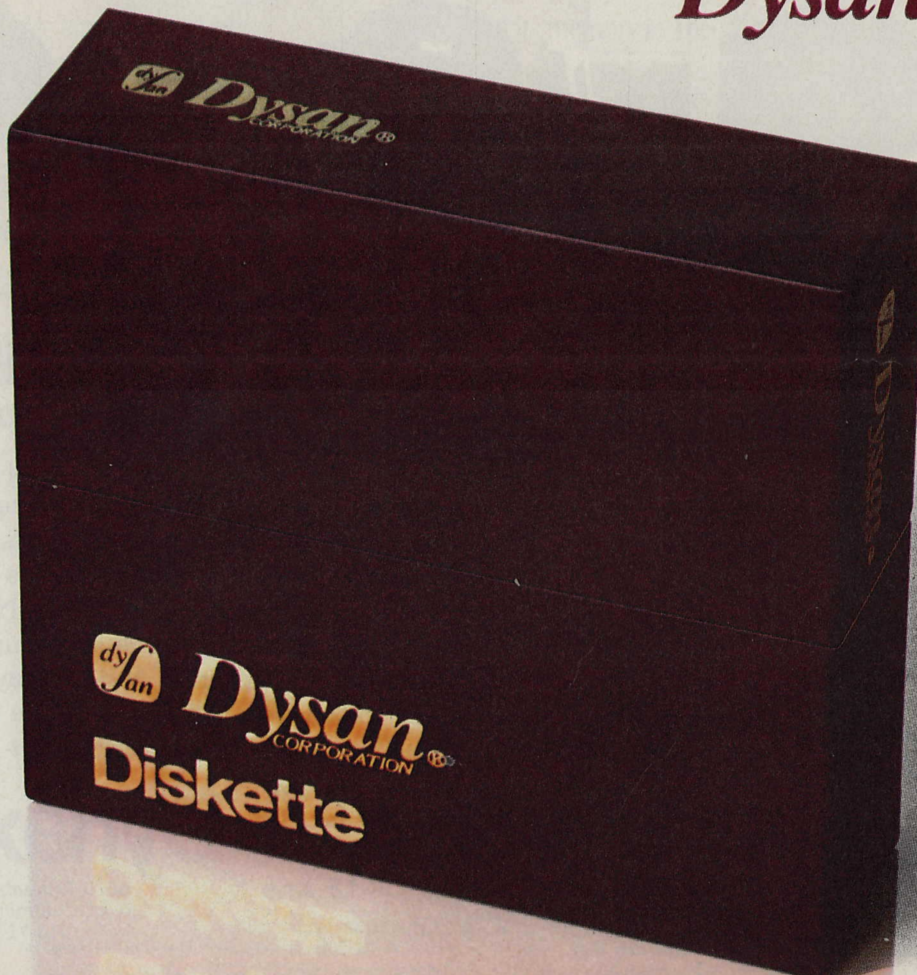
We're not just like everybody else.

Dysan 5¼″ and 8″ flexible diskettes are available at your computer products dealer.

Call toll free for the name of the Dysan dealer nearest you. (800) 551-9000.

Dysan Corporation, 5201 Patrick Henry Drive,
P.O. Box 58053, Santa Clara, CA 95050, (408) 988-3472.

Dysan®



Dysan is a registered trademark of Dysan Corporation. © 1984, Dysan Corporation.

Circle 31 on inquiry card.

says, "in return for a couple of Lisas, a couple of Macintoshes, and the right to buy a lot of hardware at discount."

It was no surprise that Ken Williams was sympathetic to Apple's plight because he is a veteran of the trademark wars himself. First of all, like every other company dealing in computer games, his firm is forced to find for each thrilling new shoot-'em-up or maze game not only a title that conveys the heart-palpitating thrills the game will produce, but a title that no one has used before. Good luck. His attorneys have pages and pages of unsuccessful trademark searches. One recent game, a Defender-like challenge that requires a player to shoot lots of enemies with a heavily armed flying submarine, went through no fewer than six name changes. There was Sky Diver, there was Neptune, there was Juggernaut . . . but there was no clear trademark until Williams and his minions finally settled on Aquatron. "The game came out a couple of months late because of the trouble in trying to pick out a name," Williams says. Meanwhile, the name Aquatron apparently carried too much ballast—the game's sales never went much above sea level.

On the other hand, Williams had long been engaged in a pitched battle to try to retain what Remer calls a weak Descriptive trademark. On-Line's very first product was a graphic adventure game called Mystery House, and it was soon followed by another called Wizard and the Princess. Williams called those games Hi-Res Adventures because the pictures that illustrated each "room" in the adventure utilized the Apple high-resolution graphics capability. On-Line trademarked that appellation, and the series is now up to eight, including the adventure game adaptation of the movie *Dark Crystal*. Williams, like most owners of a trademark, then went about spending money on advertising and promotion to let people know that the label Hi-Res Adventure signified a Sierra On-Line game, something the user could trust, and all that stuff. So he was not happy when a small company called Phoenix Software (based in that Arizona city) began putting out some graphic adventures of its own, calling them Hi-Res Adventures.

"We wrote them a cease-and-desist letter," Williams explains. "Normally when you write that, they stop using the trademarked name. But in this case, they said, 'no, it's too generic for a trademark.' Well, I had spent so much to promote it . . . we didn't mind if they called it *high resolution* adventures, just not Hi-Res. A name is an investment—I don't think it's a generic name—some people pick really generic names, like Flight Simulator. So my lawyers sued them. I wound up spending 50K on it, won the suit, and that company went out of business, probably as a result of the lawsuit."

What a cautionary fable! American business perpetually engaging in battle, crying "Remember the name!" Meanwhile, the legal struggles are putting companies out of business! And the kicker to this sad story? According to Williams, the lawyers of the out-of-business company are appealing the decision!

Williams can't believe it. And meanwhile, one game in the series of Hi-Res Adventures, called Mission: Asteroid, is being singled out by Atari for trademark infringement. According to Williams, Atari believes that the name is too close to Atari's best-selling game Asteroids. It certainly was a coup for Atari to trademark that single word which connotes such space excitement—but can Atari rightfully claim all variations of that word in the computer field?

Obviously, it is a herculean task to find and trademark an unclaimed name that has verve, sex appeal, and overtones of earth-shattering significance.

From Cosmos to Gavilan

Obviously, it is a herculean task to find and trademark an unclaimed name that has verve, sex appeal, and overtones of earth-shattering significance. Take, for instance, the case of what is now called the Gavilan Computer, the nifty little MS-DOS portable. It started life as the Cosmos Computer. Now, the name Cosmos is suitably weighty. It holds the requisite degree of science-consciousness and has a spiritual, hip component to boot. Perhaps the company could have developed some sort of ad campaign like "Take the Cosmos with you . . ." But it was not to be—someone else owned the word Cosmos in a few of the international markets, including the American.

"At that time our company was pretty small," says Karen Kohberger, an executive at Gavilan who readily responded to my query about the origin of the Gavilan name. "So we hired a firm that thinks up names."

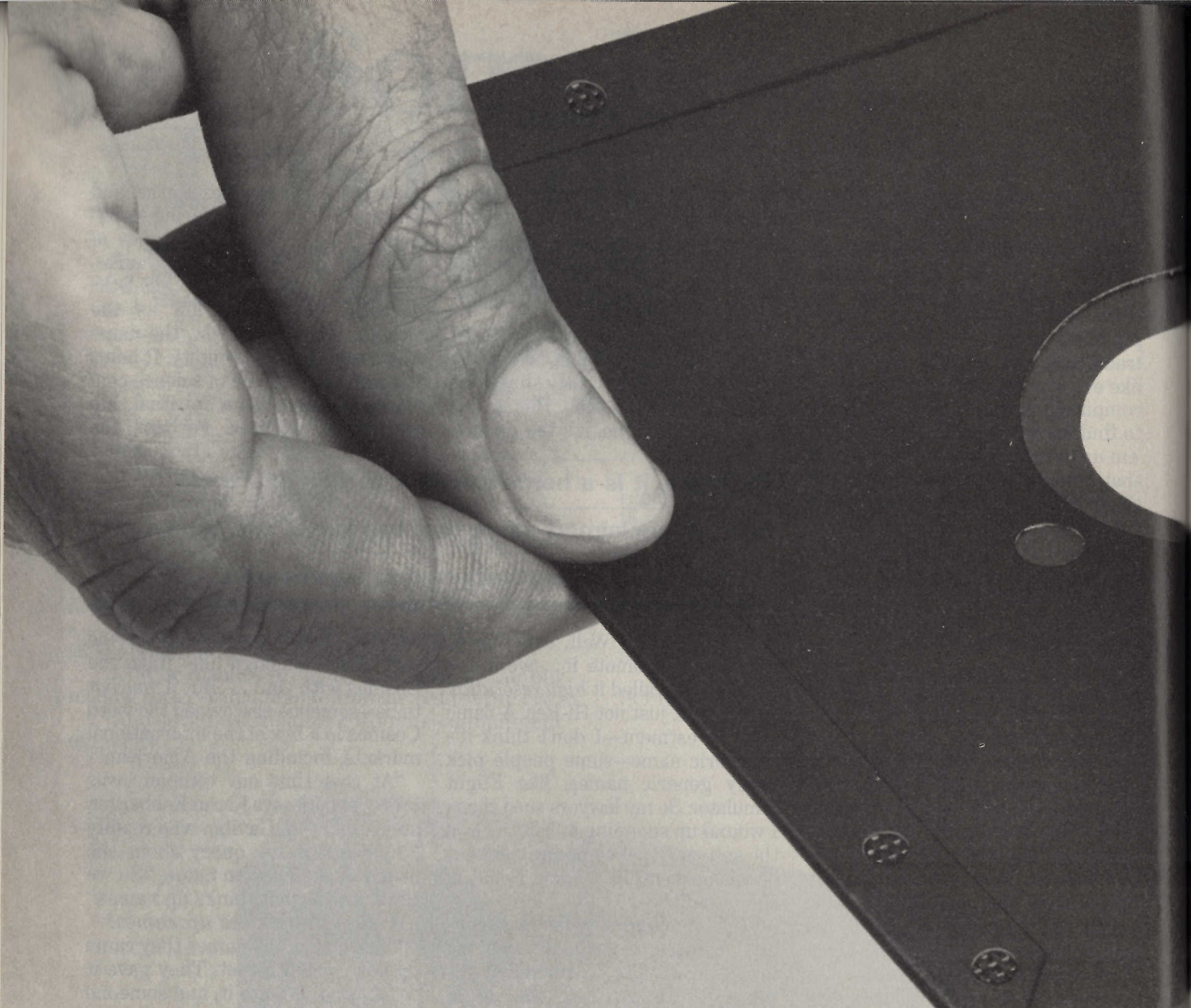
A firm that thinks up names?

"Yes. One of the names they came up with was Mindset. They gave it to us, we didn't use it, and someone else took it." (She is referring, of course, to the Mindset computer, another MS-DOS machine noted for its graphics capabilities.) "We eventually went through two hundred forty-two names. What were they? Well, Colleague was one. That wasn't easy to spell. Then there was Companion. Some names already were trademarks."

I asked if losing names that way was disappointing.

"Well, there were so many names, it was hard to get attached to any. Eventually a vice president here was looking at a local history [of the San Jose area] by an artist. It mentioned the Gabilan Mountains nearby, and he thought of the biggest, Gavilan Peak—it means red-feather-chicken-hawk in Spanish—and we all thought it had a nice sound."

Better yet, no one else had a



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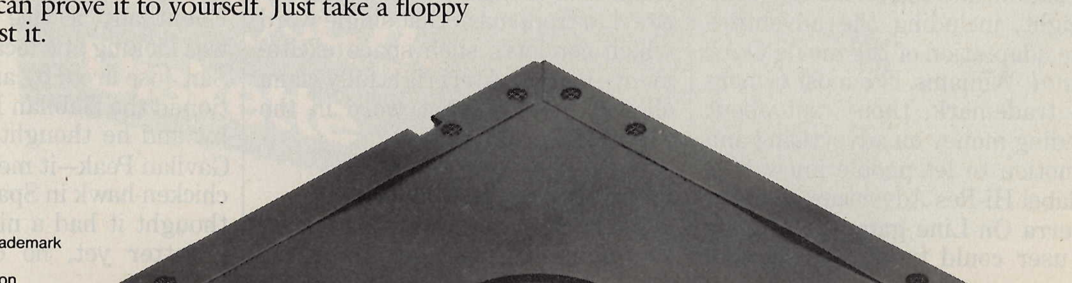

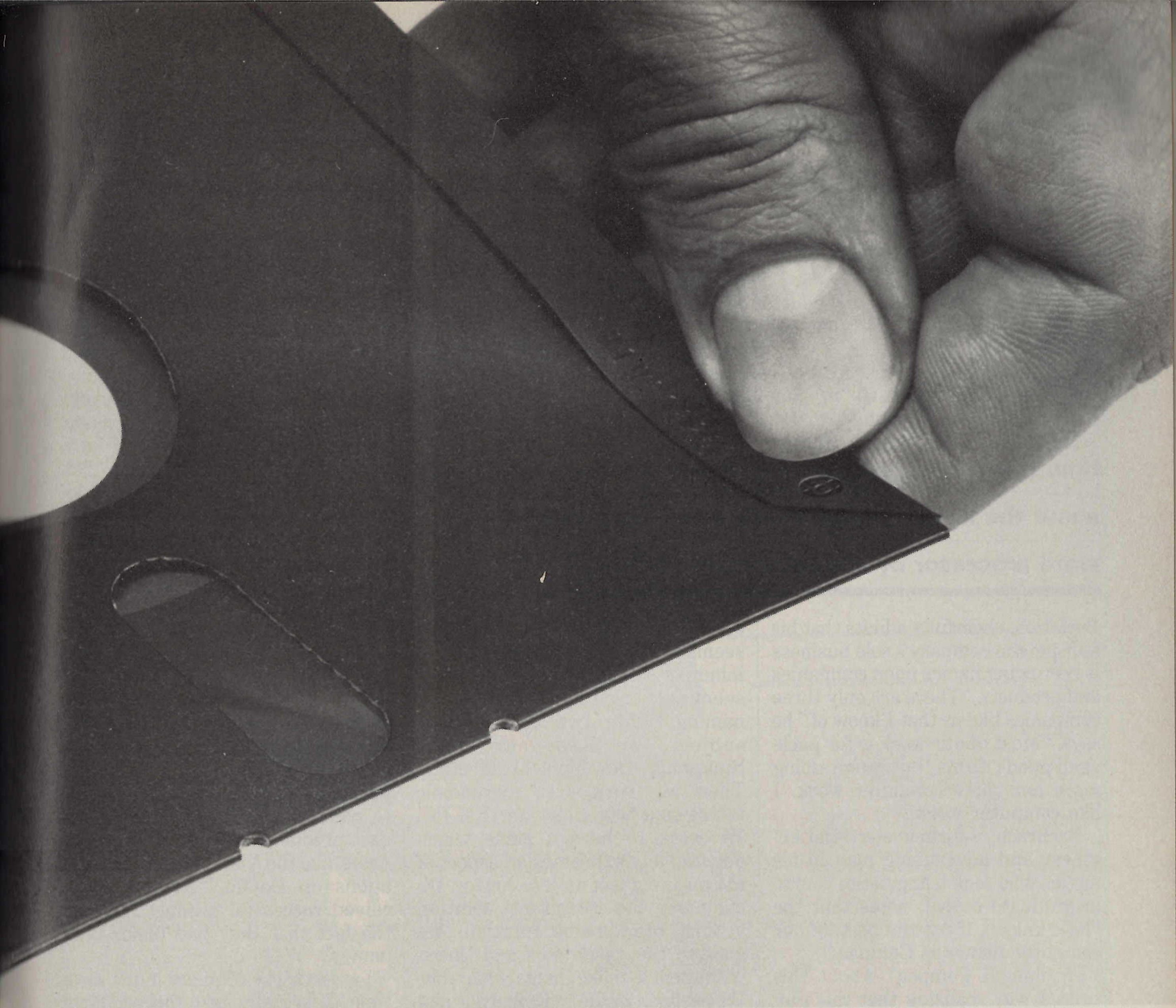

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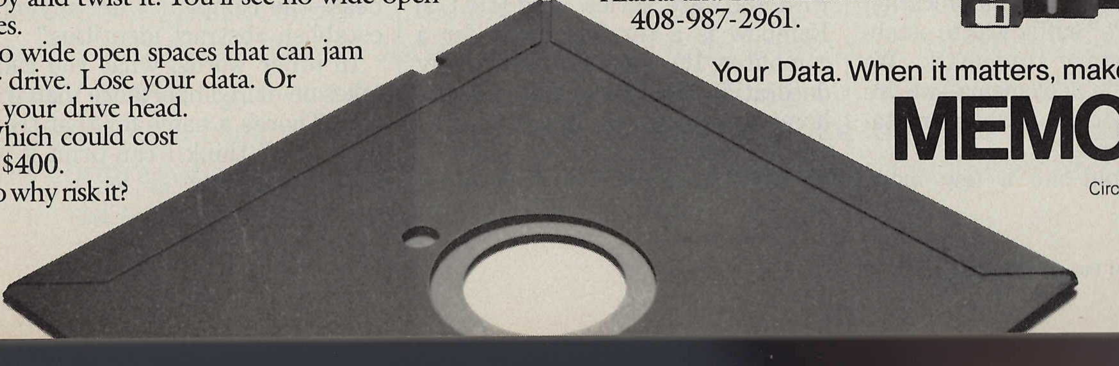


trademark on it. I thanked Karen Kohberger for her help and asked her one more question—was there really a company that did nothing but think up names?

"Yes. It's called NameLab and it's in San Francisco. The man's name is Ira."

Karen Kohberger was correct—there *was* a NameLab in San Francisco, and its founder, Ira Bachrach, cheerfully admits that his four-person company's sole business is bestowing names upon companies and products. "There are only three companies like us that I know of," he says. "Most of our work is for packaged-goods firms, but we're doing more and more computer work. I like computer work."

How much does substance matter when we are talking about the illusory magic that's in a name? Would a word processor by any other name delete as sweet?

Bachrach, a former electrical engineer and advertising man in his forties who took a linguistics course in graduate school, notes that the "best-known, if not the best, of our computer names is Compaq."

He named Compaq? About this time, I was realizing that this guy was a mother lode of naming information and decided to let him talk as long as he wanted.

"The company was originally called Gateway Technologies," says Bachrach. "We make names by assembling words from units called morphemes. [These are units of meaning that cannot be broken down into smaller units.] There are 62,000 morphemes in the English language. The computer was a portable, so we focused on morphemes that conveyed the sense of a small, integral object—like *pod* and *pack*. The *com* conveys communication abilities. The "q" suffix was to establish a proprietary trademark. We deal primarily in neologisms—we are much less good at adapted metaphors [like Apple]."

Bachrach told me a few more names he came up with—a voice data telephone called Ambi (like the deer? I wondered), a software company called Cognos, the database program called Dayflo. A series of computer-and-communications stores called Datago. And, of course, Mindset, though he didn't mention that the name was recycled.

He used the same process for coming up with all these names; he seems to be aiming at some sort of inhuman scientific precision in the seemingly mystical practice of naming. "After two weeks on the subject, we have our Input Statement Development Meeting. Then we work with morphemic tables on a computer—an IBM PC. We work to have a name which denotatively expresses an aspect of the meaning you wish to convey. We compare the resultant solution against brand-name function. We analyze the candidates and tinker with them to make them memorable. We perform a symbolic analysis and check for hidden connotation. The client gets proposed names which are not registered trademarks, and he picks from an array of solutions."

The charge for NameLab's customized services? Between $30,000 and $35,000 a search. "Often, the fee is contingent upon succeeding," Bachrach says.

Good and Bad Names

Bachrach had plenty to say about the names in the computer industry. "There are many companies with horrible names. Ashton-Tate. The PFS software series. And [DEC's] Rainbow is a terrible name for a computer. It's feminine, affectively decorative. The Texas Instruments home computer—if Texas Instruments hadn't insisted on calling it the 99/4A, they'd still be in the home computer business."

So much for the bad names. Bachrach will acknowledge the good, too. For instance, he thinks that some names are just fine. "Apple is an utterly brilliant, fantastic solution," he said of the name that a kid in his twenties almost casually bestowed on his garage company.

I asked Bachrach what he thought of the name PCjr. "Not a good name, but not terrible." Would IBM have been better off with Peanut? "No. Peanut is too diminutive, almost derisive." Bachrach was not very comfortable discussing IBM, it turned out, because he was currently talking with that company about naming some of its new products.

Bachrach made a special plea for using Coined trademarks—new words—for software products. "It's better to communicate newness and softwareness by coining a word," he explains. He also noted that when a company offers a line of software products, it's much more impressive to name it as a "fusion set," with each product a variation of the same name, like the Visi series or the variations on Dayflo. "Retailers perceived successful product lines by the fact that they had fusion-type names."

I guess those retailers didn't have time to actually test the products themselves. But then, how much does substance matter when we are talking about the illusory magic that's in a name? Would a word processor by any other name delete as sweet? No one seems to be asking those questions. Companies pour more and more money into the sizzle—finding names, promoting names, suing people for infringing on their names—that it's a wonder they have any time to tend to the steak. The point is, as Ira Bachrach says, "The computer business is drifting toward the packaged-goods business—the companies are trying to establish abstract identities."

In other words, what you call it takes on more importance than what it is. There's a name for that trend, but I don't think I can print it in a family magazine. □

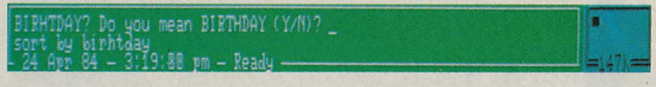
"Heaven Knows How I'd Keep Track of My Flock Without Infoscope."

Before we got Infoscope, I frankly didn't know what to do with our church's personal computer. Now I don't know what I'd do without it. Infoscope lets me put virtually anything in our computer, and take anything out in whatever form I need. I can see how a business could use data management like that. But my "business" is my congregation — and I never knew my congregation so well before.

Wait till you see what we get out of Infoscope ...

"Our Computer Never Did So Much Before."

I've got every church member in here. Names. Addresses. Children. Anniversaries. Pledges. Special needs. Volunteer projects. Infoscope makes it easy to enter information. If I make a mistake (no man is perfect), Infoscope suggests an alternative.

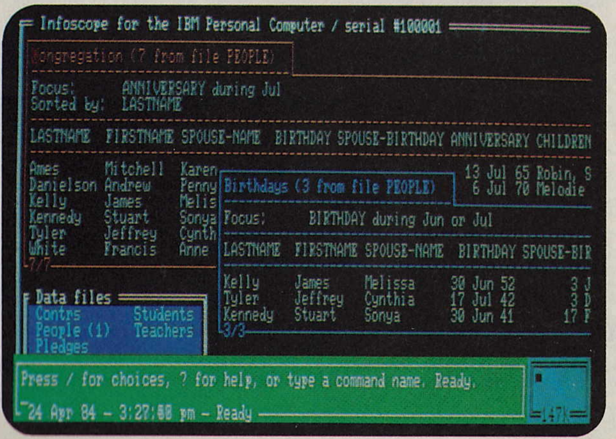


```
BIRHTDAY? Do you mean BIRTHDAY (Y/N)? _
sort by birhtday
- 24 Apr 84 - 3:19:00 pm - Ready                          =147K=
```

If I misspell a word, Infoscope suggests the right spelling. Politely, I might add. None of this SYNTAX ERROR business. I don't need scolding.

I Forget Anniversaries. Infoscope Doesn't.

Once I've entered the data, I just ask Infoscope to pull out all anniversaries of our members for, say, January. Before I can blink my eyes, I've got it. I remember birthdays the same way. My congregation thinks it's wonderful, the kind of memory I have. It's hard to believe that pastors used to keep all this in their heads. Or, forgive me, but maybe they didn't ...



```
= Infoscope for the IBM Personal Computer / serial #100001 ========
Congregation (7 from file PEOPLE)
Focus:      ANNIVERSARY during Jul
Sorted by:  LASTNAME
LASTNAME  FIRSTNAME SPOUSE-NAME  BIRTHDAY SPOUSE-BIRTHDAY ANNIVERSARY CHILDREN
Ames      Mitchell  Karen                                13 Jul 65 Robin, S
Danielson Andrew    Penny Birthdays (3 from file PEOPLE)  6 Jul 70 Melodie
Kelly     James     Melis
Kennedy   Stuart    Sonya Focus:     BIRTHDAY during Jun or Jul
Tyler     Jeffrey   Cynth
White     Francis   Anne  LASTNAME  FIRSTNAME SPOUSE-NAME  BIRTHDAY SPOUSE-BIR
7/7
                          Kelly     James     Melissa    30 Jun 52        3 J
Data files ===            Tyler     Jeffrey   Cynthia    17 Jul 42        3 D
 Contrs       Students    Kennedy   Stuart    Sonya      30 Jun 41       17 F
 People (1)   Teachers    3/3
 Pledges
Press / for choices, ? for help, or type a command name. Ready.
24 Apr 84 - 3:27:00 pm - Ready                              =147K=
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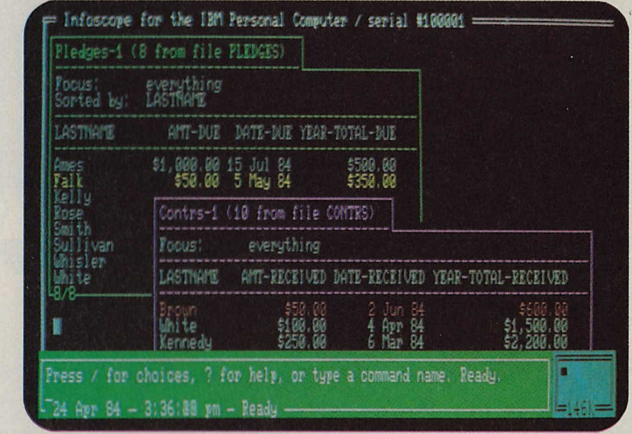
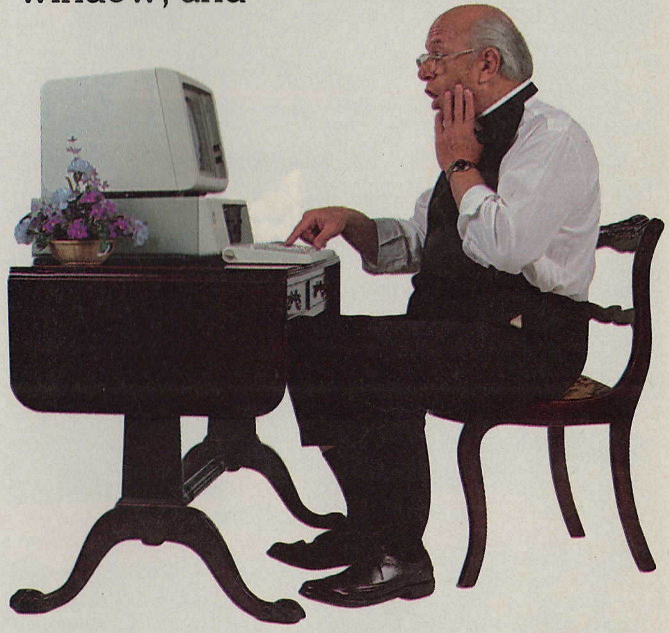
Building Fund Pledges Here. Contributions Here.

Anytime you want to compare data, Infoscope lets you create windows.



```
= Infoscope for the IBM Personal Computer / serial #100001 ========
Pledges-1 (8 from file PLEDGES)
Focus:      everything
Sorted by:  LASTNAME
LASTNAME        AMT-DUE  DATE-DUE YEAR-TOTAL-DUE
Ames        $1,000.00 15 Jul 84         $500.00
Falk           $50.00  5 May 84         $350.00
Kelly
Rose        Contrs-1 (10 from file CONTRS)
Smith
Sullivan    Focus:      everything
Whisler
White       LASTNAME   AMT-RECEIVED DATE-RECEIVED YEAR-TOTAL-RECEIVED
8/8
            Brown           $50.00      2 Jun 84              $500.00
            White          $100.00      4 Apr 84            $1,500.00
            Kennedy        $250.00      6 Mar 84            $2,200.00
Press / for choices, ? for help, or type a command name. Ready.
24 Apr 84 - 3:36:00 pm - Ready                              =146K=
```

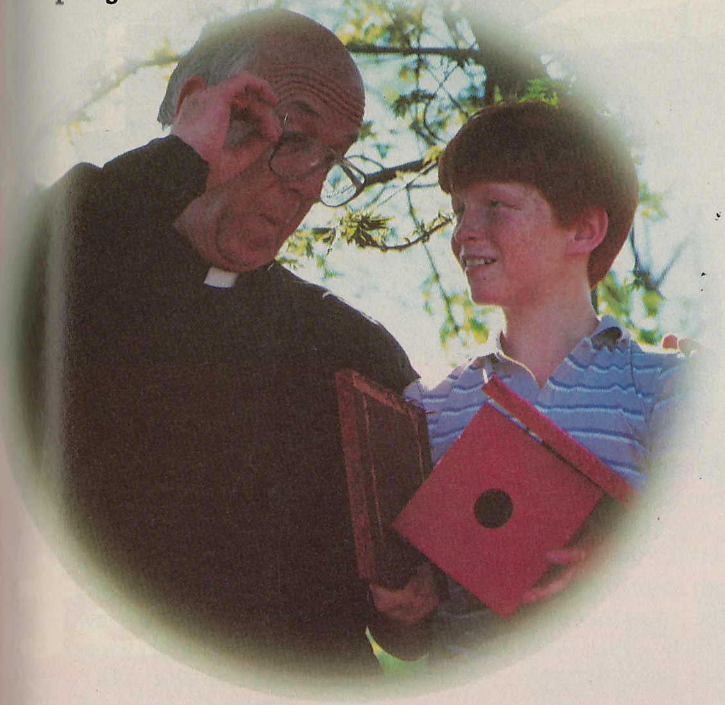
I can see our pledge list in one window, and



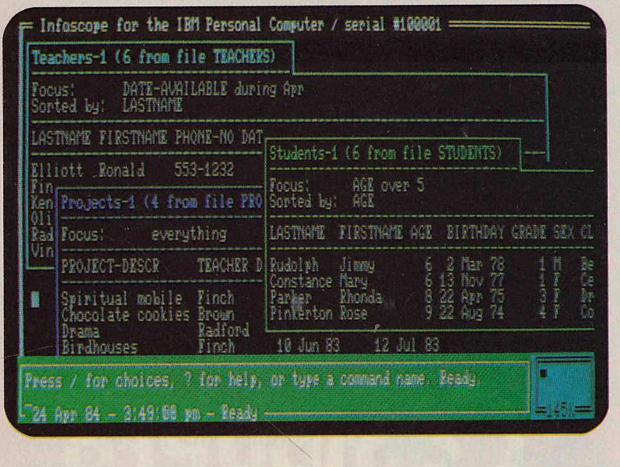
contributions in another. The only thing Infoscope doesn't know is that Bill Martin is late paying his pledge because Sue has been sick. That's my department.

I Can Create a Window for Everything.

For example, Vacation Bible School. In one window, I pull out and display all the volunteer teachers. In another, I scroll through last year's students. In another, all the class projects.



And so on. I can make each window as large as I want, and put it anywhere on the screen I want.



```
= Infoscope for the IBM Personal Computer / serial #100001 ==========
 Teachers-1 (6 from file TEACHERS)
 Focus:      DATE-AVAILABLE during Apr
 Sorted by:  LASTNAME
 LASTNAME FIRSTNAME PHONE-NO DAT
                                Students-1 (6 from file STUDENTS)
 Elliott .Ronald    553-1232
 Fin                            Focus:      AGE over 5
 Ken Projects-1 (4 from file PRO Sorted by:  AGE
 Oli
 Rad Focus:      everything     LASTNAME  FIRSTNAME AGE  BIRTHDAY GRADE SEX CL
 Vin
     PROJECT-DESCR     TEACHER D Rudolph   Jimmy       6  2 Mar 78     1 M   Be
                                Constance Mary        6 13 Nov 77     1 F   Ce
 ▮   Spiritual mobile  Finch    Parker    Rhonda      8 22 Apr 75     3 F   Dr
     Chocolate cookies Brown    Pinkerton Rose        9 22 Aug 74     4 F   Co
     Drama             Radford
     Birdhouses        Finch     10 Jun 83    12 Jul 83
 Press / for choices, ? for help, or type a command name. Ready.
 24 Apr 84 - 3:49:08 pm - Ready ----------------------------------- =145K=
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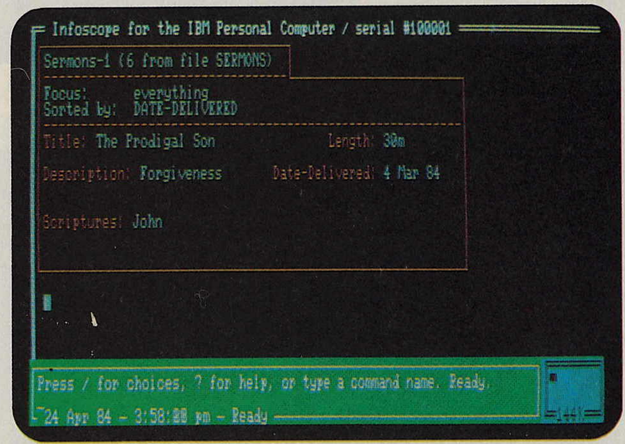
It just took the right program. With Infoscope, we can enter data ... sort it



```
= Infoscope for the IBM Personal Computer / serial #100001 ==========
 Sermons-1 (6 from file SERMONS)
 Focus:      everything
 Sorted by:  DATE-DELIVERED
 Title: The Prodigal Son               Length: 30m
 Description: Forgiveness         Date-Delivered: 4 Mar 84

 Scriptures: John


 ▮
 Press / for choices, ? for help, or type a command name. Ready.
 24 Apr 84 - 3:58:08 pm - Ready ----------------------------------- =144K=
```

... compare it in expanding movable windows ... even pull out data from a larger data base. No software ever did so much to make a microcomputer so valuable. I swear by — well, I appreciate very much what it does for me.

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Evaluating Software

Finding bugs before programs reach dealers' shelves

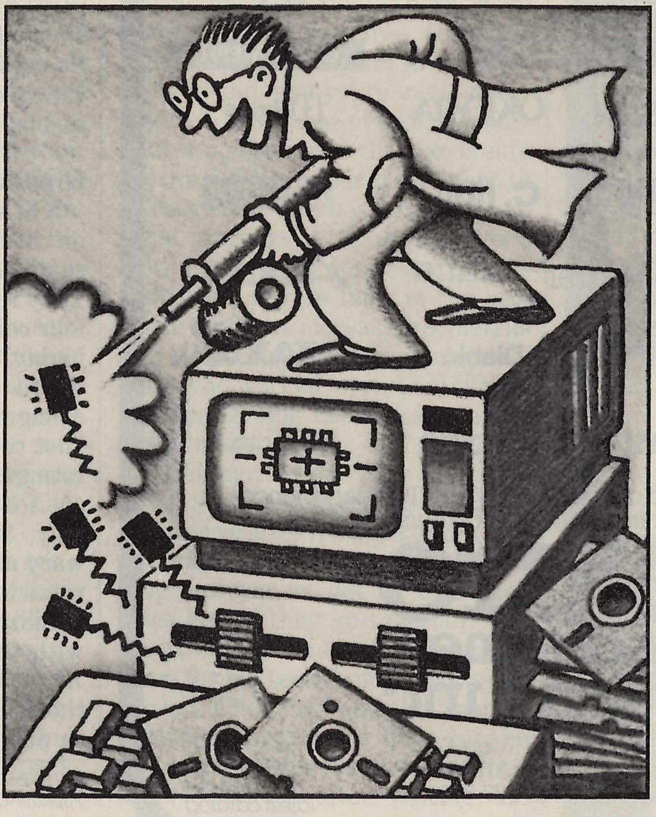
by A. Richard Immel

When he talks about microcomputer software, Los Angeles businessman Bill Schoneman doesn't mince words. "There is no good software," he says. He's exaggerating, of course, but he makes a valid point when he says there is altogether too much software out on the market that doesn't work right because it's got bugs in it.

Bill Goss and Lee Sprague, two ex-Hewlett-Packard engineers, have come to a similar view. In today's increasingly harried rush to get to the marketplace first with the latest, too many software producers are cutting corners by failing to adequately test their creations before they go out to sit on dealers' shelves like so many shrink-wrapped booby traps. "It's time the buyer of a piece of software not be the test department for the company that developed it," Sprague declares.

A recent example of that very situation comes from none other than Microsoft Corp., one of the leading software producers in microcomputing, and the Apple Macintosh version of its Multiplan spreadsheet package. In order to meet Apple's January 24, 1984 introduction date for Mac, Microsoft skirted its normally extensive testing schedule for Multiplan. It wasn't long before stories of occasionally scrambled spreadsheets starting drifting to the company's Seattle headquarters. "By March we knew we had a bug," says a chagrined Jeff Harbers, one of Microsoft's software production managers. The company fixed it and shipped 6000 new Multiplan packages to replace those already in the hands of early Macintosh users.

It is exactly this sort of expense and inconvenience that Mssrs. Schoneman, Goss, and Sprague have taken action to stamp out. Schoneman is a vice president of a company with the semi-unpronounceable name of XXCAL Inc. (change the first *X* to an *E* to say it out loud). XXCAL's main business is providing contract programming services to various computer companies via a network of freelance programmers, but it has branched out into independent software evaluation and testing. In its fiscal year that ended March 31, this part of the business brought in some $1.5 million in revenues, Schoneman says. Customers included Texas Instruments, Wang, Epson, and Commodore.



Goss and Sprague are cofounders (president and executive vice president, respectively) of another software testing company that goes by the optimistic, if ungainly, name of International Bureau of Software Test, or IBST, for short. Last year, Sunnyvale, California-based IBST brought in about $700,000 from its testing and software evaluation; this year Goss sees revenues jumping to "well over $1 million" and pos-

Illustration by Robert Gale

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sibly tripling to $2 million or so. IBST's client list includes names like Atari, Digital Research, Hewlett-Packard, Peachtree, Texas Instruments, Epson, Verbatim, Micropro, and Fujitsu.

At this moment, both of these testing firms are pursuing with missionary zeal the goal of becoming what you might call the official termite inspectors of the microcomputer software industry, although they tend to express these yearnings in more lofty terms.

IBST, for example, wants to be the Underwriters Laboratories of software. (Underwriters Laboratories is the outfit that tests consumer electrical products and affixes that ubiquitous little UL seal on the bottom of your toaster and on every lamp cord in the house.) Toward that end IBST has created a circular "seal of approval" for companies to paste onto retail packages of software that has passed the IBST quality test. The hope is that the seal will become so recognizable consumers will demand it when they buy a software package. "We'd like to have the respect of UL and the recognition of *Good Housekeeping*," Sprague says. So far, few recipients of the seal have shown even the slightest interest in displaying it on their products.

Grading Software

XXCAL also puts approval seals on the software it tests, although its seals are more like meat grades. They're rectangular and come in four colors: gold for "recommended highly," silver for "recommended," white for "recommended with changes/corrections," and red for "not recommended." Unlike IBST's ratings, XXCAL's recommendations are for its customers' internal use only; Schoneman says the firm is wary about seals of approval at the retail level because of possible legal liability if a customer has trouble with the product. Needless to say, XXCAL doesn't pass out many of the red ones. "It takes a lot of guts to put that on," Schoneman says.

A. Richard Immel is a contributing editor of *Popular Computing*.

IBST and XXCAL customers generally fall into two categories: software vendors who have a new software package they want tested by someone outside the company, and computer manufacturers who are considering selling someone else's software, either bundled with their equipment or under their recommendation. They want to know which software to pick and how well it works with their equipment. Sprague also says IBST is doing more testing of a third category, IBM compatibility. This is either to determine how compatible a piece of software is with the various "PC-compatible" computers or how well an IBM-compatible package runs on a particular non-IBM machine.

XXCAL and IBST do similar work in a similar fashion. They first prepare elaborate and detailed testing plans that include each test step right down to the keystrokes that are to be used. Bug reports are prepared for the customer, including instructions on how to re-create each bug.

Common bugs include things like "limit" errors—for example, a database that holds 1000 records but crashes if 1001 records are entered; frustrating loading instructions; and improper performance, such as a general ledger accounting program that drops every tenth file. The testers also make suggestions to improve poorly written manuals.

Both firms offer several levels of testing ranging from cursory screening on up to a final review of a software package that has been under previous testing and is presumably ready for market. Bugs and other errors are prioritized by their seriousness (for example, fatal, serious, cosmetic, and improvements that would be "nice" to have).

"There are cases where we get a product and turn up 50 bug reports in one day," Schoneman says, adding, "if the second day is the same, we stop and give it back." Schoneman recalls one engineering package where the formulas were wrong. The company that wrote the package flew out a programmer to correct them, and testing continued.

Sometimes it's not so much outright bugs as it is a package that's inappropriate for its intended market. An example would be a home finance program that is really geared to commercial use because it includes things like a subsidiary ledger or a chart of accounts, both unnecessary for home finances. This may be a case where a software manufacturer "may be trying to pull the wool over the eyes of the hardware vendor," Schoneman says.

The cost of these services ranges widely from less than $1000 for a quick look at a manual on up to $100,000 and more for full-blown major projects. Sprague says one of his company's biggest jobs on an operating system produced a stack of reports a foot and a half high.

Bug-Infested Software

Why does software have so many bugs? It seems to be the nature of the beast. One thing on which computer professionals agree is that beyond a certain level of complexity (an average spreadsheet program is well above that threshold) there is no such thing as bug-free software. Even when a program is well designed—and many are not—somewhere in that mass of code is a mistake or a peculiarity that can create anything from minor discomfort to unimaginable havoc when triggered. What triggers it? Nobody knows. Until it happens. Moreover, the likelihood of a severe fault in the program tends to increase geometrically with the number of programmers who worked on it. That means large programs need to be tested early in the game.

"IBM learned this long ago," says Sprague: "Don't start testing a piece of software after it's done. If ten programmers are doing ten pieces of a program, you've got to test each piece before they go together."

Software normally goes through three formal tests before it hits the market. The first—and the least effective debugging—is done by the programmer who wrote it. It's ineffective because after writing the

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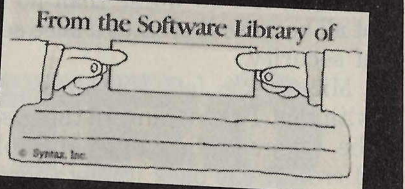
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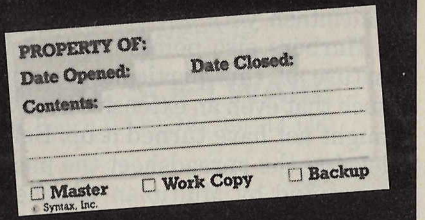

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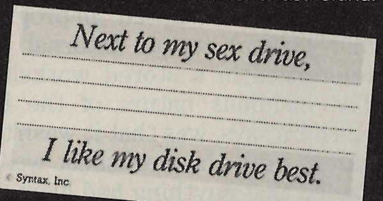
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program most programmers can't really believe there's anything wrong with it. Besides they're far too knowledgeable; they know how to avoid the quirks. (That can even happen to the testers. Sprague says that on one seven-week project he had to use three testers because they got too "smart" and learned to avoid the bugs.)

The next step is what's called an "alpha" test, which is running the program within the company. Last is the "beta" test, when the program is cast out into the real world, but under controlled conditions. Not every company does beta testing and that's not all bad. Bill Goss of IBST claims that a bad beta test plan, that is, one that isn't rigorous enough, can be worse than no test at all because it creates a false sense of security.

Microsoft's Jeff Harbers agrees with that 100 percent. In the case of the bugged Macintosh Multiplan, Microsoft cut back its beta testing from several dozen sites to only three or four. A major reason, Harbers says, was a shortage of Macintosh machines on which to do testing (Apple hadn't released Macintosh yet).

Harbers also points out that the nature of this particular bug was such that even an extensive beta test might not have turned it up. Before leaving the spreadsheet the user is prompted by Multiplan whether it should update the stored version of the file. In the faulty package a yes response triggered the bug, which altered (or "corrupted" in programmer jargon) certain internal data references in a stored worksheet. The insidious nature of the bug, Harbers says, was that it wasn't apparent until the worksheet was reloaded that anything had happened to it. What made it particularly difficult to trace was that in most cases this corruption didn't have any effect at all, because it acted on an unused portion of the worksheet.

Normally it's the "cottage industry" software producers, the one-programmer-locked-in-a-loft type, who come up short on bug testing, but even the mightiest sometimes fall. IBM's first word processor for its PC, a hasty translation of a program called Easy Writer, which was originally written for the Apple II, was plagued with problems (it hadn't run all that well on the Apple, either). It eventually had to be rewritten.

IBM had another problem at the same time with its BASIC language interpreter. It seems there was a little bug in it that created number-rounding errors. They were small ones, to be sure, and most people wouldn't have noticed them. Users of Peachtree accounting software did, however, because Peachtree software was written in compiled IBM BASIC; the error was just big enough to throw the numbers out of whack by the end of the accounting year.

Of course IBM corrected these bugs, with some embarrassment, and has since taken steps to prevent a recurrence of the situation. Programs it buys from outsiders are carefully scrutinized now to make sure the claims of the programmer match the program's performance and that the documentation is up to snuff. "You learn as you go along," says an IBM spokesman.

Where does all this leave the poor consumer? IBST's Sprague thinks that consumers should demand that the software they buy show some proof that it has been tested. The IBST seal will do quite nicely, he thinks.

Name Recognition

But that's not likely to happen in the foreseeable future. One reason is that the bigger firms that IBST has done work for—companies like Hewlett-Packard and Digital Research, for example—like to think their own names carry more integrity in the marketplace than the name of some little testing firm of obscure origins. The main reason they send software testing work out at all is usually to double-check their own debugging procedures.

Taurus Systems was the first software company to receive the IBST seal for an application package called CP+ two years ago. CP+ is a program that simplifies the definitely user-unfriendly CP/M operating system for novice computerists who don't want to learn about CP/M. John Simpson, president of the Lafayette, California-based company (since renamed Analytica) likes what IBST does but doesn't think the seal itself helped his product any. "It's a novel idea," he says, but "I wouldn't say we got any benefit from it." Simpson says the program never went over and his company hasn't been actively selling it for about a year. He says he'll probably call on IBST to test a new business analysis package his company is working on, but it won't be to get the seal.

Satisfied Client

On the other hand, Verbatim Corp. is a happy IBST customer that did use the seal. Sort of. Last year Verbatim hired IBST to debug and evaluate its first consumer software product, a series of personal computer business analysis and decision-making packages (whether to lease or buy, calculating financial ratios, etc.). Richard Diamond, Verbatim's director of MIS (Management Information Systems) was surprised at how tough they were. "We expected them to say 'We've never seen anything this good,' " he says. Instead IBST found some bugs—including part of a program that computed interest incorrectly—and suggested several design changes. Verbatim made the changes and was awarded the seal.

The company didn't put the seal on its packages because they were sold by direct mail, but it did use the emblem in promotional materials. Unfortunately, the products didn't sell and have since been withdrawn from the market. Diamond is still enthusiastic about IBST, however.

"To me the seal is a promotional device that says to the consumer 'this has been tested,' " he says. "I think it had a positive effect; it has to add credibility; it tells people you've gone an extra step to sell a bug-free product." □

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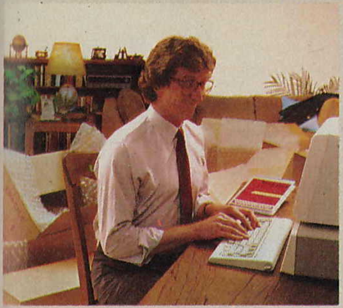

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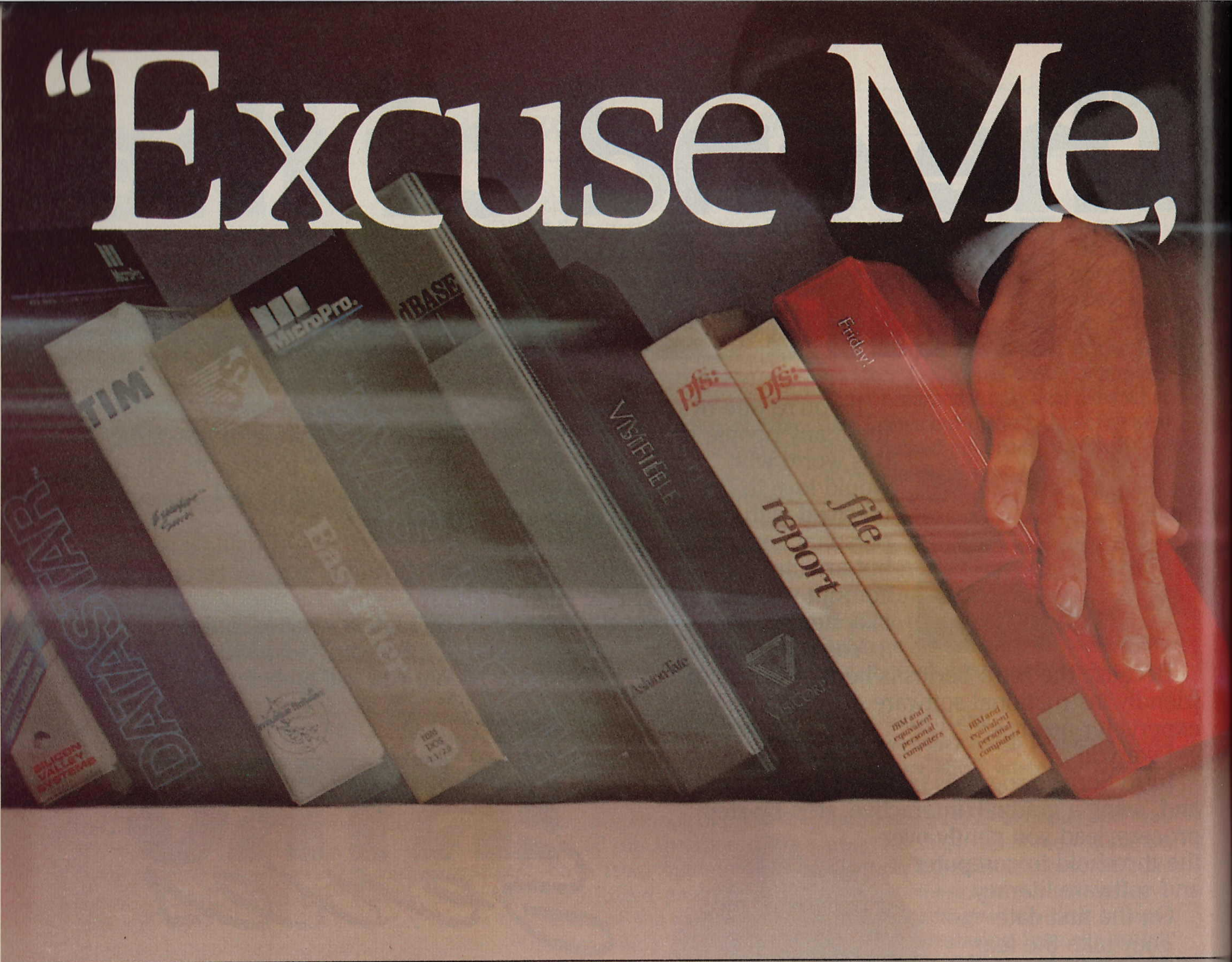

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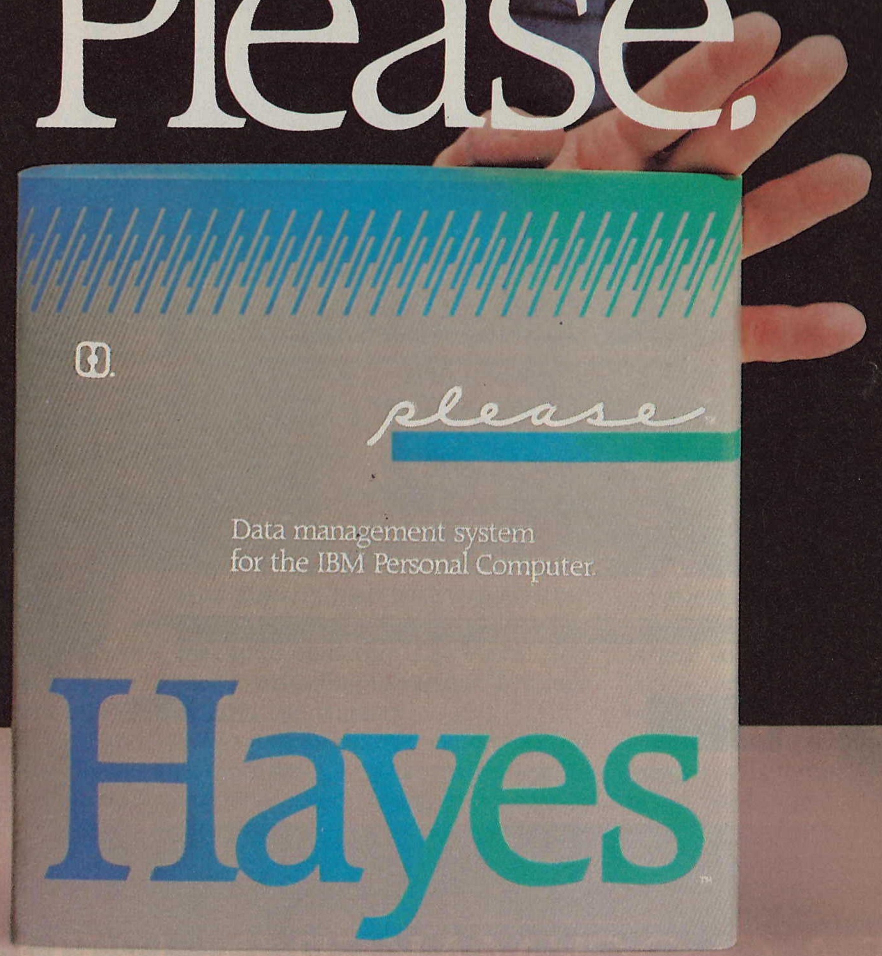

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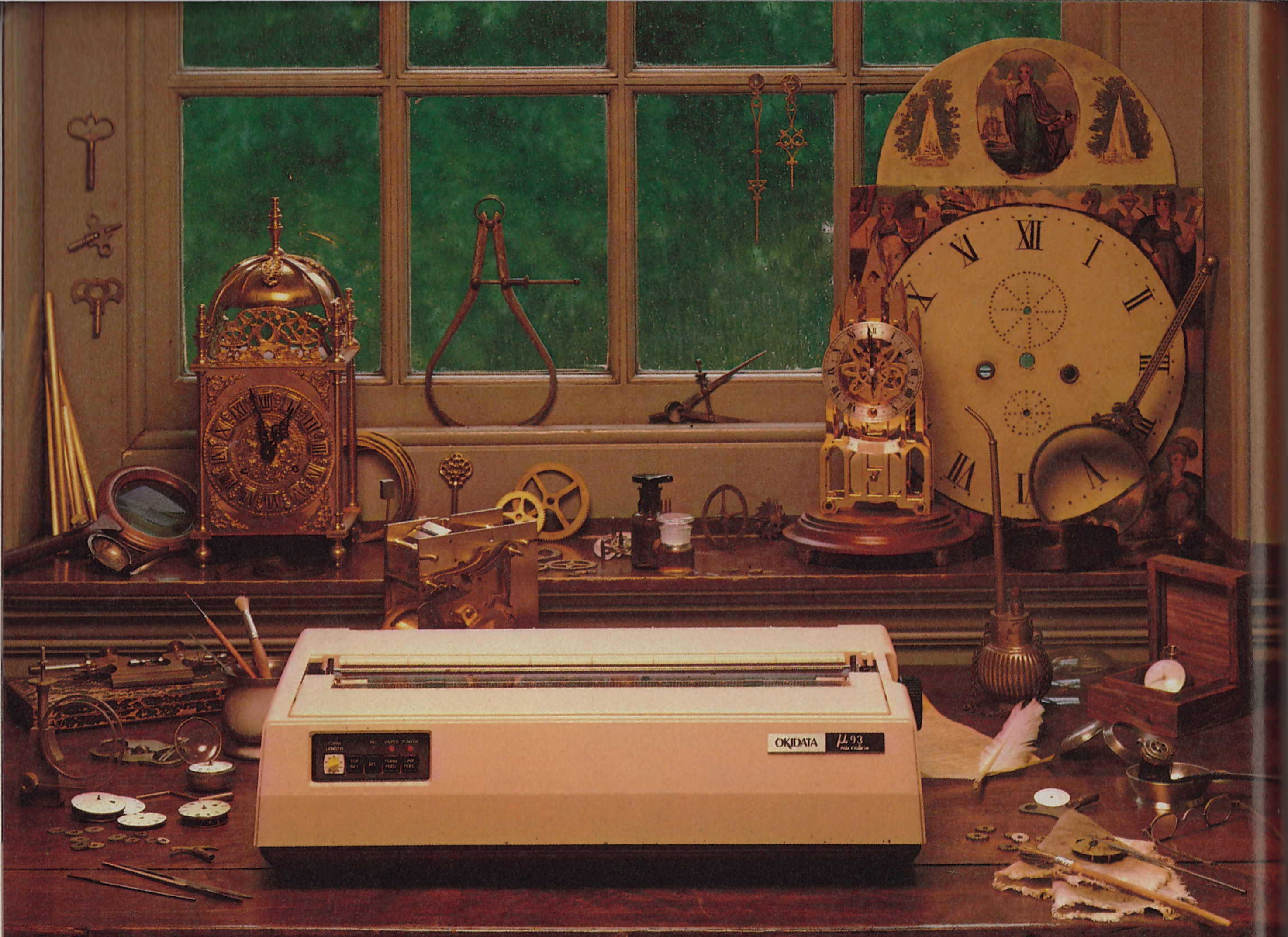

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Adding Vision to Computers

Machines that see and read are moving into industry, offices, and homes

by Thom Hartmann

The once-revolutionary idea of computers functioning as handy adjuncts to the human brain because of their ability to store and process information has become commonly accepted fact. Now technology is pushing the human analogy even further in the recent development of computers with the equivalent of sensory functions: machines that can recognize, analyze, and interpret visual images.

Using a technique called optical character recognition (OCR), these machines can read characters, pages of text, and many other kinds of images. There are intelligent cameras, used in industrial applications to replace human eyes. There are hand-held machines that read prices, inventory listings, and entire books, one line at a time. There are desktop units, about the size of an office photocopier, that read entire pages in a variety of typefaces and feed what they've read into a small (or large) computer via a standard RS-232C port. There are refrigerator-sized pieces of office machinery that read books, or even hand-written documents, at a rate of thousands of pages per hour. And already mail with typewritten zip codes is being read and sorted by machines that the U.S. Postal Service is installing in various locations around the country.

Like the ubiquitous photocopier—or the computer, for that matter—these machines are dropping in price, complexity, and size at a frantic rate. Already more than 30 companies manufacture some sort of OCR device, and a good half-dozen are competing to sell to the office and home microcomputer markets.

Intelligent computer vision, the larger technology of which optical character recognition is a part, is basically a three-step process. First an arithmetic "sequence" of data is formed, which represents the object being viewed (called *image formation*); the data is then analyzed (called *image analysis*) and interpreted according to specific criteria (*image interpretation*). In human terms this corresponds roughly to "see the object, examine the object, and mentally compare the object with previously seen objects to determine what it is."

Forming Images

The process of "seeing" is only a slight variation of the way a TV camera works. With a TV camera, light falling on a "retina" of the camera is converted, in a continuous scan, into electrical variations. As the retina is scanned—left to right, then down one line, then left to right again, 265 times per screen, 60 screens per second—information is created which is later recombined in the same sequence to create the picture you see on TV.

Where a computer vision system differs from a TV system is in the individual lines: instead of a continu-

Illustration by Dave Suter

To figure out what an image represents, a computer vision system compares the image to a stored set of templates or parameters that represent a given set of objects.

ous stream of varying information, as in a TV image, a computer-generated "line" is made of a series of dots, or pixels, each having a specific numerical value. In rudimentary computer vision systems, each pixel is either black or white, on or off—represented by a numeric 1 or 0. The images produced are similar to the "computer photographs" that you can have taken in shopping malls by a video camera, computer, and dot-matrix printer. More sophisticated systems assign each pixel a value from 0 to 63, or 0 to 255, to represent the relative brightness (called *gray-scale*) of the image. On an 8-bit system, the values of 0 to 63 are stored as a single byte. With a 16-bit computer, a single byte can be any number between 0 and 255. After a digitized camera converts an image into a stream of numbers, the data is fed into the computer. A program tells the computer how to go about reconstructing the stream of numbers so that it will have meaning. This process could be as simple as matching the stream of numbers with number sets stored in memory or running a complex algorithm that produces conclusions based on the probability of what the information being viewed is.

To make it easier for the computer to understand what it's seeing, image-enhancement techniques are often used. These can take a variety of forms and represent one area where research is moving very fast. The most common image-enhancement technique for OCR readers is "edge detection."

Because the edges, or outlines of objects, are where the obvious changes in contrast occur, edge detection is a fairly easy operation for a computer. The computer checks the incoming data stream for the places where the values of the numbers change most rapidly (along a sharp edge, for example, an image may suddenly jump from a brightness of 3 or 4 up to a brightness of 200 to 230) and then eliminates all the other, more subtle gradations it has in memory. A scan-line that encounters the edge of a character may, for example, be represented this way: 200 205 209 196 25 27 22 190 200 205. By segmenting the image with edge detection, a computer notices those regions of rapid change and transforms the above series of numbers into: 255 255 255 255 0 0 0 255 255 255. The net effect is dramatically increased contrast, converting the image of a character into a virtual line drawing.

Interpreting Images

The process of figuring out what an image represents is the most complicated part of computer vision. It's usually done by comparing the image after it's been properly analyzed, with a stored set of templates or parameters that represent a given set of objects or characters. This simplest form of comparison is usually done by one of two processes—template matching or feature matching. Template matching is basically a square-peg/square-hole process. The computer assumes that the given character will always appear the same and looks only at the edges and shapes of the character, trying to come up with an exact or near match to a character already in memory. Feature matching, on the other hand, includes considerations of overall size, surface area, shape, etc., as well as a search for a template-like match.

Typically, when a printed page is read by an OCR reader, each character's area is broken down into a grid of 2048 individual pixels (a matrix of 64 by 32 pixels), each covering an area of 0.000016 square inch. Because each pixel has a numeric value corresponding to its location on the page, somewhat like a post-office box, it's a simple matter for the computer to compare the contents of each of the "boxes" being scanned with the 128 or so boxes in memory, representing all the letters, numbers, and symbols used in modern written communication.

Fancier (and more expensive) systems have a number of different sets of templates for comparison with incoming data. With some OCR readers you first determine the typeface you're going to read, then switch in the templates for that typeface from the computer's memory. With others, the switch or search for typefaces is done automatically.

Trickle-Down Technology

OCR readers started out as components of large-scale industrial machinery but have since begun to scale down in price and size. In 1982, Cognex of Boston brought out a streamlined example of OCR technology for industrial applications called Dataman. Roughly the size of a personal computer (though at $30,000, not yet the price), Dataman's four major components—camera, 9-inch monitor, keyboard, and processor—together weigh about 50 pounds.

Dataman's unique proprietary software uses a combination of a local-feature recognition technique, a global-features technique, and the ability to search for distinctive features when confused. This enables it to read characters even when they're obscured by dirt, are poorly printed, partially worn away, or badly lighted. Dataman's character-reading ability covers an extraordinary range, from reading billboards to deciphering laser-etched characters on silicon only 1/15,000-inch high. A typical industrial application might be warehouse distribution, where the computer reads numbers printed on the

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Thom Hartmann is a contributing editor of *Popular Computing.*

sides of cardboard boxes coming down a conveyor belt and sorts them accordingly.

Equipped with another software package called Check Point, Dataman can also perform inspections, recognizing certain preprogrammed features by shape and size, contrast, or position measurements. Currently, Westinghouse is experimenting with using the system in its Winston-Salem, North Carolina, factory to forge turbine blades. The computer reads pallets in the area to select appropriate billets, watches carefully while a robot integrated with the Dataman system picks a billet off a pallet, then heats and forms the billet in the furnace, producing the turbine blade. Before the finished blades are packaged for shipping, the robot holds each blade up to Dataman's camera "eye" to check for defects.

Office Applications

Along with the development of industrial systems, desktop OCR products for use with microcomputers, like the Workless Station from Dest Corporation, are starting to pop up in offices around the country. The Workless Station, one of the most advanced of the low-cost OCR devices available, can read entire typewritten pages and send the words directly from the page into a computer. Connection to the computer is simple: the Dest unit has one cable that plugs into an RS-232C port and another cable that plugs into a wall socket for power.

The theory behind the development and marketing of the Dest OCR reader is that many offices have numerous typists, or process a lot of written communications, but don't have a proliferation of "originating" word processors. A computer-linked page reader like the Dest unit can't be beat for filing applications, doing word-processing editing on typewritten documents, and data entry.

"One of our clients, for example, is a bank," says Tom Gately, the Atlanta representative for Dest. "They have a lot of internal cables that need to be sent, which originate in different parts of the bank at different times. In the past, a data-entry operator retyped each cable into the machine for transmission. Now anybody can type their own cable, and the person who runs the cable machine just drops a stack of messages into the top of the Dest machine, and off they go to their destinations electronically."

When I used the unit, I loaded the communications package I normally use with my modem, set it for 1200 baud, 8-bit words, null parity, one stop bit, and was ready to go. I fed a typewritten page (it had been typed with three different type styles, in two different sizes) into the hopper on the top of the Dest unit and pushed the Read button. The machine made whirring and chugging noises as it ate the paper, an inch at a time, and a strange pink light leaked from the corners and cracks of the machine. After about 15 seconds, it spit the paper back out, and the screen of my computer began to scroll through all the words that had been on that page.

The Workless Station is not cheap. The stripped-down version, which can read only one typeface, starts at $6995. The fully equipped model, which reads nine typefaces (up to eight resident in the machine at one time) and has fancy formatting capabilities, sells for about $10,000. Even so, the cost could be justified for an office that moves a lot of paper or has heavy archival needs.

Still there are some things that Dest's OCR reader can't do. It can't, for example, read proportional-spaced type. This rules out copying entire books into the machine or even documents that have been typed or printed on proportional-spacing printers or typewriters. I tried feeding pages from a paperback novel, from a dictionary, and from my IBM Electronic 50 (proportional spacing) typewriter into the Dest device with little success. OCR devices are available that will read these sorts of documents but they range in price from $80,000 all the way up to $1 million.

Looking Ahead

Optical character recognition is still new and advancing, with changes in the field occurring almost daily. Besides the experimental work that companies like Westinghouse are conducting, a number of universities are involved in OCR research. Among them are the University of Rhode Island, which is teaching robots to pick parts from bins; Stanford University, doing research on military applications for intelligent vision systems; and Carnegie-Mellon and MIT, both of which are following several lines of inquiry, including using computers to inspect printed circuit boards and developing more sophisticated software systems to aid in the recognition of objects, shapes, or characters.

A number of the newest OCR systems, most used in industrial and commercial applications, bear such spiffy-sounding names as "holographic scanners" (used for reading bar codes in supermarkets), "charge-coupled presence-absence devices" (which produce an output similar to a scanner's, only on a much larger scale), and "circularly formatted expandable magnetic-ink codes" (you'll find them on price tags in some clothing stores and on the back of some credit cards).

Along with all these systems, OCR products for use with microcomputers may eventually become as standard as peripherals like modems and printers. The Omni-Reader, an OCR device from Oberon International in Irving, Texas, is already available for Apple, IBM, Hewlett-Packard, and many other computers for only $495. Desktop units, which read an entire page at a time, start at around $7000—far less than what a small computer cost just 10 years ago. And with about 30 American companies pursuing the market, it's a safe bet that we'll soon see more, better, cheaper, and smaller OCR devices. No doubt, the Dest unit and others like it are just the first wave of what promises to be a flood of timesaving computer products that will show up in even the smallest offices and in homes as well. □

ous stream of varying information, as in a TV image, a computer-generated "line" is made of a series of dots, or pixels, each having a specific numerical value. In rudimentary computer vision systems, each pixel is either black or white, on or off—represented by a numeric 1 or 0. The images produced are similar to the "computer photographs" that you can have taken in shopping malls by a video camera, computer, and dot-matrix printer. More sophisticated systems assign each pixel a value from 0 to 63, or 0 to 255, to represent the relative brightness (called *gray-scale*) of the image. On an 8-bit system, the values of 0 to 63 are stored as a single byte. With a 16-bit computer, a single byte can be any number between 0 and 255. After a digitized camera converts an image into a stream of numbers, the data is fed into the computer. A program tells the computer how to go about reconstructing the stream of numbers so that it will have meaning. This process could be as simple as matching the stream of numbers with number sets stored in memory or running a complex algorithm that produces conclusions based on the probability of what the information being viewed is.

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Interpreting Images

The process of figuring out what an image represents is the most complicated part of computer vision. It's usually done by comparing the image after it's been properly analyzed, with a stored set of templates or parameters that represent a given set of objects or characters. This simplest form of comparison is usually done by one of two processes—template matching or feature matching. Template matching is basically a square-peg/square-hole process. The computer assumes that the given character will always appear the same and looks only at the edges and shapes of the character, trying to come up with an exact or near match to a character already in memory. Feature matching, on the other hand, includes considerations of overall size, surface area, shape, etc., as well as a search for a template-like match.

Typically, when a printed page is read by an OCR reader, each character's area is broken down into a grid of 2048 individual pixels (a matrix of 64 by 32 pixels), each covering an area of 0.000016 square inch. Because each pixel has a numeric value corresponding to its location on the page, somewhat like a post-office box, it's a simple matter for the computer to compare the contents of each of the "boxes" being scanned with the 128 or so boxes in memory, representing all the letters, numbers, and symbols used in modern written communication.

Fancier (and more expensive) systems have a number of different sets of templates for comparison with incoming data. With some OCR readers you first determine the typeface you're going to read, then switch in the templates for that typeface from the computer's memory. With others, the switch or search for typefaces is done automatically.

Trickle-Down Technology

OCR readers started out as components of large-scale industrial machinery but have since begun to scale down in price and size. In 1982, Cognex of Boston brought out a streamlined example of OCR technology for industrial applications called Dataman. Roughly the size of a personal computer (though at $30,000, not yet the price), Dataman's four major components—camera, 9-inch monitor, keyboard, and processor—together weigh about 50 pounds.

Dataman's unique proprietary software uses a combination of a local-feature recognition technique, a global-features technique, and the ability to search for distinctive features when confused. This enables it to read characters even when they're obscured by dirt, are poorly printed, partially worn away, or badly lighted. Dataman's character-reading ability covers an extraordinary range, from reading billboards to deciphering laser-etched characters on silicon only 1/15,000-inch high. A typical industrial application might be warehouse distribution, where the computer reads numbers printed on the

Thom Hartmann is a contributing editor of *Popular Computing.*

sides of cardboard boxes coming down a conveyor belt and sorts them accordingly.

Equipped with another software package called Check Point, Dataman can also perform inspections, recognizing certain preprogrammed features by shape and size, contrast, or position measurements. Currently, Westinghouse is experimenting with using the system in its Winston-Salem, North Carolina, factory to forge turbine blades. The computer reads pallets in the area to select appropriate billets, watches carefully while a robot integrated with the Dataman system picks a billet off a pallet, then heats and forms the billet in the furnace, producing the turbine blade. Before the finished blades are packaged for shipping, the robot holds each blade up to Dataman's camera "eye" to check for defects.

Office Applications

Along with the development of industrial systems, desktop OCR products for use with microcomputers, like the Workless Station from Dest Corporation, are starting to pop up in offices around the country. The Workless Station, one of the most advanced of the low-cost OCR devices available, can read entire typewritten pages and send the words directly from the page into a computer. Connection to the computer is simple: the Dest unit has one cable that plugs into an RS-232C port and another cable that plugs into a wall socket for power.

The theory behind the development and marketing of the Dest OCR reader is that many offices have numerous typists, or process a lot of written communications, but don't have a proliferation of "originating" word processors. A computer-linked page reader like the Dest unit can't be beat for filing applications, doing word-processing editing on typewritten documents, and data entry.

"One of our clients, for example, is a bank," says Tom Gately, the Atlanta representative for Dest. "They have a lot of internal cables that need to be sent, which originate in different parts of the bank at different times. In the past, a data-entry operator retyped each cable into the machine for transmission. Now anybody can type their own cable, and the person who runs the cable machine just drops a stack of messages into the top of the Dest machine, and off they go to their destinations electronically."

When I used the unit, I loaded the communications package I normally use with my modem, set it for 1200 baud, 8-bit words, null parity, one stop bit, and was ready to go. I fed a typewritten page (it had been typed with three different type styles, in two different sizes) into the hopper on the top of the Dest unit and pushed the Read button. The machine made whirring and chugging noises as it ate the paper, an inch at a time, and a strange pink light leaked from the corners and cracks of the machine. After about 15 seconds, it spit the paper back out, and the screen of my computer began to scroll through all the words that had been on that page.

The Workless Station is not cheap. The stripped-down version, which can read only one typeface, starts at $6995. The fully equipped model, which reads nine typefaces (up to eight resident in the machine at one time) and has fancy formatting capabilities, sells for about $10,000. Even so, the cost could be justified for an office that moves a lot of paper or has heavy archival needs.

Still there are some things that Dest's OCR reader can't do. It can't, for example, read proportional-spaced type. This rules out copying entire books into the machine or even documents that have been typed or printed on proportional-spacing printers or typewriters. I tried feeding pages from a paperback novel, from a dictionary, and from my IBM Electronic 50 (proportional spacing) typewriter into the Dest device with little success. OCR devices are available that will read these sorts of documents but they range in price from $80,000 all the way up to $1 million.

Looking Ahead

Optical character recognition is still new and advancing, with changes in the field occurring almost daily. Besides the experimental work that companies like Westinghouse are conducting, a number of universities are involved in OCR research. Among them are the University of Rhode Island, which is teaching robots to pick parts from bins; Stanford University, doing research on military applications for intelligent vision systems; and Carnegie-Mellon and MIT, both of which are following several lines of inquiry, including using computers to inspect printed circuit boards and developing more sophisticated software systems to aid in the recognition of objects, shapes, or characters.

A number of the newest OCR systems, most used in industrial and commercial applications, bear such spiffy-sounding names as "holographic scanners" (used for reading bar codes in supermarkets), "charge-coupled presence-absence devices" (which produce an output similar to a scanner's, only on a much larger scale), and "circularly formatted expandable magnetic-ink codes" (you'll find them on price tags in some clothing stores and on the back of some credit cards).

Along with all these systems, OCR products for use with microcomputers may eventually become as standard as peripherals like modems and printers. The Omni-Reader, an OCR device from Oberon International in Irving, Texas, is already available for Apple, IBM, Hewlett-Packard, and many other computers for only $495. Desktop units, which read an entire page at a time, start at around $7000—far less than what a small computer cost just 10 years ago. And with about 30 American companies pursuing the market, it's a safe bet that we'll soon see more, better, cheaper, and smaller OCR devices. No doubt, the Dest unit and others like it are just the first wave of what promises to be a flood of timesaving computer products that will show up in even the smallest offices and in homes as well. □

Bridging the Gender Gap

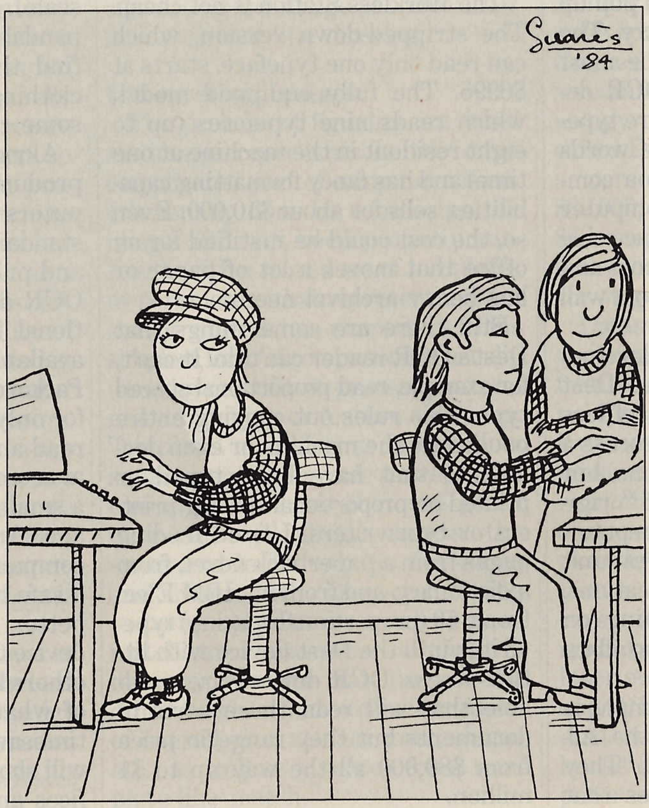
Despite improvements, boys still outnumber girls in advanced computer classes

by Dan Watt

Statistics show that the world of computing is still primarily male-dominated. Historically, more men than women have been involved with computers. And although women are beginning to use computers in the work environment in rapidly increasing numbers, nothing like parity exists in higher-level positions such as systems analyst or programmer. A 1982 study of high-tech jobs in Santa Clara County, California, conducted for the U.S. Civil Rights Commission, showed that women held 68 percent of the nonprofessional computer jobs but only 17 percent of the professional positions.

Use of microcomputers in the schools is seen as the great equalizer, the way to tap the talents of half our potential work force. If children were introduced to computers early enough, and if schools maintained equal access to computing throughout the grades, girls, by the time they graduate, should be as well qualified for careers as computer professionals as boys are.

Unfortunately, girls are not leaving school with the same computer proficiency as their male counterparts.



Youngsters may start out with equal access to microcomputers, but after a few years, boys outpace girls.

In a 1981 survey conducted for the National Institute of Education (NIE), Karen Scheingold of Bank Street College pointed out that she hadn't found any *systematic* efforts to exclude girls from computer access. However, she wrote, "In all of our sites we observed differential use (of microcomputers) according to sex. . . . At the elementary level, each sex could and did use the micro more or less equally. But, starting in seventh grade, when the micros moved out of the classrooms and hallways into math and business departments, there was an overwhelmingly male representation among students who used the micros."

Henry J. Becker, of Johns Hopkins University's Center for the Social Organization of Schools, has spent the last three years collecting data about the use of microcomputers in the schools. In a 1982 report entitled *Microcomputers in the Classroom—Dreams and Realities*, Becker estimated that, in the schools he surveyed, about half of the first-grade students interested in learning to program computers were boys. By sixth grade the ratio increased to about two-thirds, and by ninth grade, more than four-fifths of the interested students were males.

A survey by Ronald Anderson, Wayne Welch, and Linda Harris, of the University of Minnesota, confirms that high school boys outnumber girls in programming courses by almost two to one. Citing data collected from 17-year-olds during a 1981-82 national assessment of science education, the report

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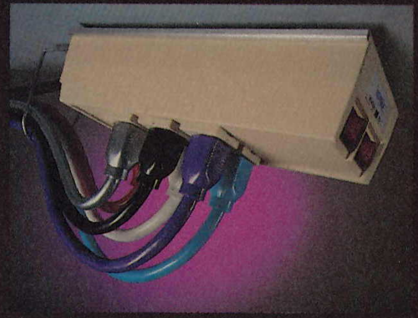

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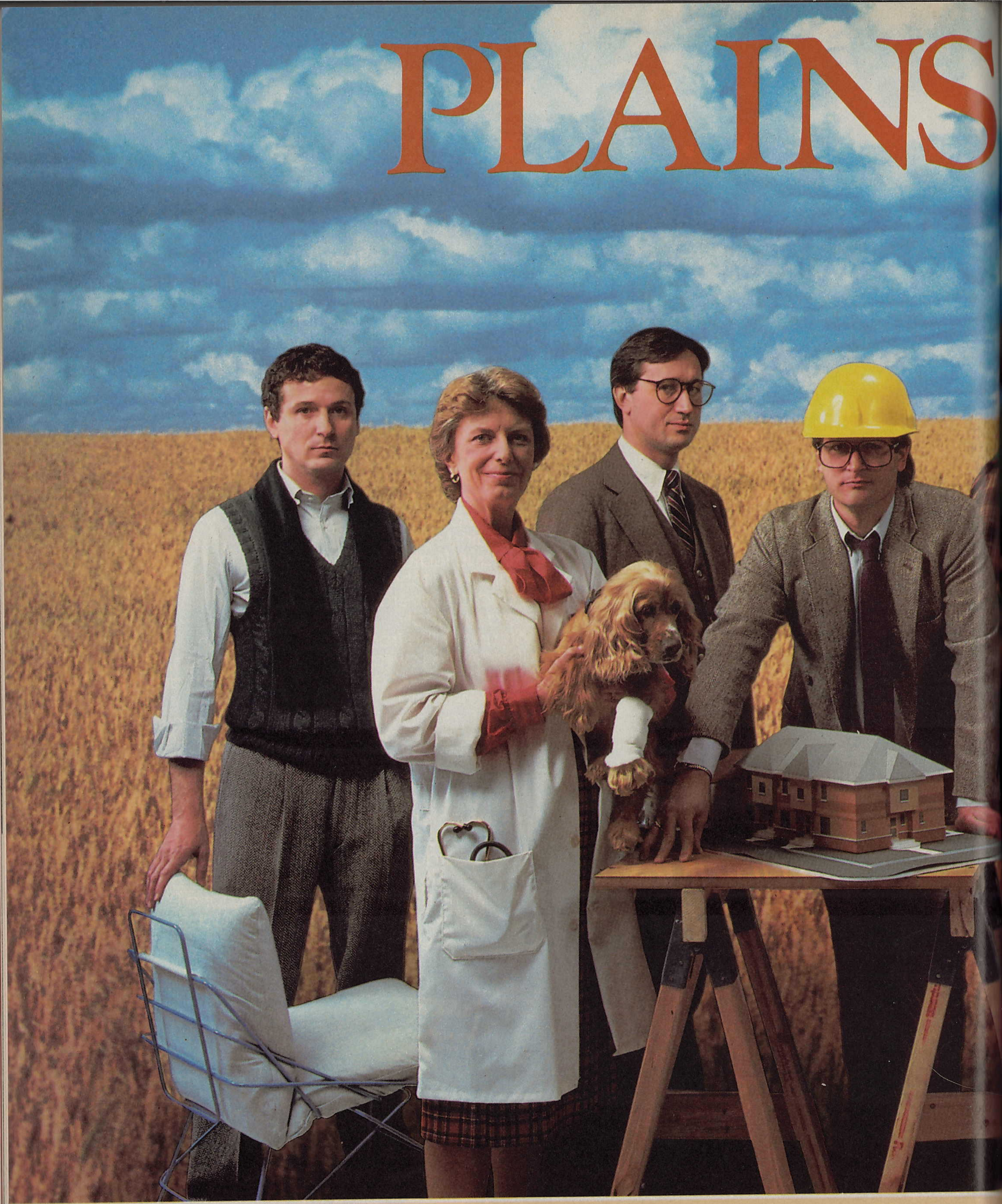

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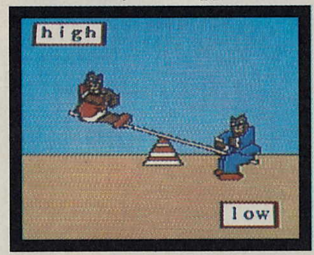

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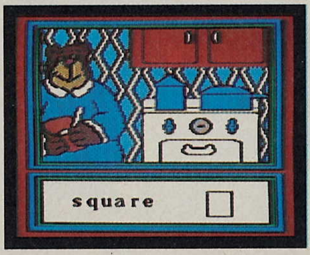

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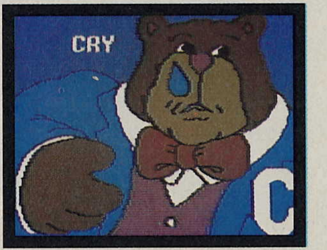

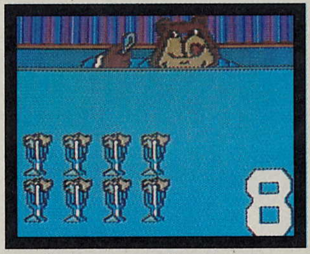

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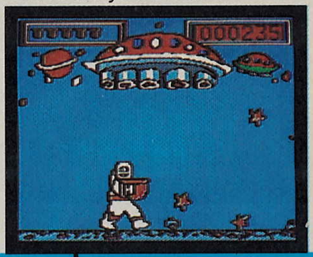

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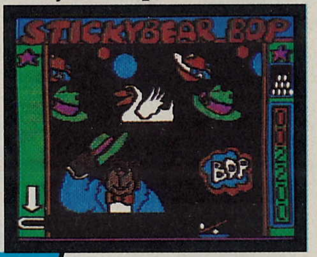

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showed that 14 percent of the boys in the national sample had taken a one-semester programming course, while only 8 percent of the girls had taken such a course.

In a study of more than 400 high school students enrolled in an introductory computer science course, Marlaine Lockheed, a senior research scientist at Educational Testing Service (ETS) found that only 8 percent of the girls ever used the school's computer center outside of classes, while almost 40 percent of the boys used the center on their own before, during, and after school.

Bridging the Gap

Researchers are looking for the causes of these sex-related inequities, and educators are looking for practical ways to start bridging the computer proficiency gender gap. Yet while evidence of this gap is easy to find, the reasons for it are much harder to pin down. Social biases, whether racial, religious, cultural, or based on sex role stereotypes, contribute to the problem.

Certain types of educational software may be part of the problem, too. Many educational programs "are written with male students in mind," says Maryann R. Marrapodi, special assistant to the chancellor of the New York City public schools. Teachers should "be aware of the subtle reinforcers used in educational software," she explains. "The packages that use shoot-em-ups, touchdowns, home runs, or other traditionally gender-related rewards will appeal more to boys than to girls."

Among the software packages that fit Marrapodi's description is Mastertype, the best-selling educational program in the country. It is an arcade-style game in which you practice typing skills by blasting "alien letters" out of the sky with a laser gun. Alien Addition and Duelling Digits, two other popular educational games, use arcade-style action to motivate children to practice basic skills in math, reading, and spelling.

"Many programs stress competition and violence," says Kay Gilliland of EQUALS in Computer Technology, a training program of the Lawrence Hall of Science in Berkeley, California. "Girls often prefer cooperation, fantasy, and music," she continues. "They are more likely to be attracted to programs where they can work together to compose a poem, draw a picture, or solve a problem."

Certain types of male-oriented educational software may be part of the sex inequity problem.

Some educational publishers are getting the message; in recent months, a number of new home/education programs have appeared with settings that appeal to a wider range of tastes than most arcade games. The themes of such programs include constructing animated scenes involving people and animals, solving spelling problems in an underwater fantasy land, furnishing imaginary houses, composing and playing music, and creating animated pictures and writing about them.

Equality in the Classroom

Another major effort on the part of sex-equity reformers is an attempt to ensure that girls have positive experiences when they do sign up for computer classes and that they are encouraged to participate in extracurricular computing. EQUALS in Computer Technology trains classroom teachers to promote computer equity. Participants in an EQUALS workshop first become more comfortable with technical aspects of computing. Then they learn many different teaching strategies to ensure that computer use is a positive experience for every student, that instruction is tailored to individual learning styles, and that girls as well as boys get involved with problem solving and programming. Participants are also urged to look for and eliminate indications of sexism in their own teaching.

"Boys are more aggressive users of computers than girls," says Maryann Marrapodi. She urges teachers to be especially vigilant to ensure that girls have an equal share of time at the computer.

Some researchers are concerned with the prevalent use of programming as an introduction to computing. In many schools, programming is closely identified with mathematics, says Dr. Patricia Campbell, an educational researcher who specializes in equity issues. Computers are housed in math departments, and programming courses are taught by math teachers, she explains. "There's a lot of research showing that women are more anxious [than men] about math. This may contribute to less computer use by girls," Campbell says.

On the Upswing

Kay Gilliland says that teachers taking EQUALS workshops reported a 12 percent gain, from 35 percent to 47 percent, between 1982 and 1983, in the number of girls enrolled in their computer classes. In California as a whole, female enrollment increased 5 percent, from 37 percent to 42 percent, during the same period. Also, a 1983 Gallup youth survey revealed that two-thirds of the girls (ages 13 to 19) surveyed plan to take computer courses in college and about half of those (one-third of the total) are looking forward to computer-related majors.

But these encouraging statistics don't mean that educators can relax; we're only beginning to rectify the inequities in computer education. Without persistent and concerted effort, the pendulum could very well swing in the other direction. ☐

For More Information

More information about the issues raised in this column can be found in *The Computing Teacher*, theme issue on Computer Equity, April 1984, Volume 11, No. 8. Available from the International Council on Computers in Education (ICCE), 1787 Agate St., Eugene OR 97403. Include $3 for a postage-paid copy.

Dan Watt is a contributing editor of *Popular Computing* and author of *Learning with Logo* (BYTE Books/McGraw-Hill, 1983).

Playing by the Rules

Constructing planets and games requires if. . . then thinking

by Jerry Pournelle

I've just come from the second annual meeting of Contact, which is a strange conference involving science fiction writers and anthropologists. I'm not sure what the attraction is, but these conferences turn out to be the most interesting meetings of the year for me.

One of the activities at Contact is called the Bateson Project. The idea is to design an alien culture and then see what kind of anthropological conclusions one might draw from contact with it.

That isn't easy to do. I expect some readers are thinking "Well, of course not," but in fact science fiction writers do it all the time; at least some of us do. It's part of the way we make our living.

Moreover, there have been several cooperative efforts, in which teams of science fiction writers worked together to design planets and alien cultures: one of the most successful was Medea, a project coordinated by Harlan Ellison, with Larry Niven, Poul Anderson, and many others taking part. One would think that a team of science fiction writers aided by several world-famous anthropologists would do even better. Alas, however, that hasn't worked out as well as it might.

One aspect of the Bateson Project is design of a planet; indeed, it was the failure to get that right as a beginning that caused a lot of the problems. You can't design a planet's inhabitants without knowing a lot about the planet; otherwise you're working without—and I guess the pun is intended—ground rules. A few moments' thought will show that climate has greatly influenced human culture here on Earth; imagine places where the gravity, atmosphere, light levels, length of day, number of moons, geologic stability, size and shape of seas, tides, and all the rest of the things we take for granted are all different. Surely even human cultures would be different on such worlds: and, more to the point, a different kind of intelligence would evolve there.

So: to create aliens one must create worlds.

That's not as hard to do as you might think. On the other hand, you can't just randomly pick sizes and shapes and atmospheres, star colors, length of planet year, climate and seasonal variations. All these things are related to each other by complex rules. Fortunately, most of the rules are summarized in an, alas, out-of-print book by Stephen Dole called *Habitable Planets for Man.*

Adeline Helps Out

In addition to Dole's book, a computer that speaks BASIC is a lot of help; so I carry along Adeline, my Otrona Attache. With Adeline's help it was no great problem setting up a planetary system for the Bateson Project. It also showed a lot of social scientists just what a small computer can do.

"All very well," my sane friend said. "I can see that these machines are wonderful, but you don't design planets every day. I know you write your books with computers, but not everyone writes for a living. What use are little computers, really, for the rest of us?"

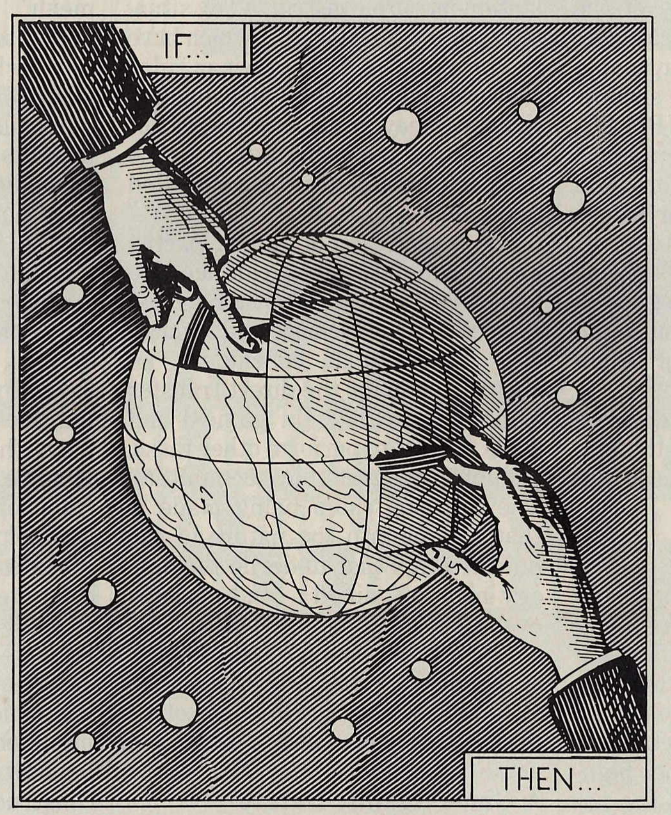
That was a serious question, and it set me to thinking. Sure, I use small computers a lot. I have about thirty of the darned things around at any given time—in fact, my wife says we've reached the saturation point at Chaos Manor. When a new computer comes in, one must go out. Or Else. Given that we have so many machines and that I spend more than half my waking life sitting in front of one or another of them, there's an obvious way to answer the question of what one does with them: I started a log.

Word processing takes up a lot of my computing activity. Everything—books, columns, story introductions, essays, etc.—is written on a computer. I edit text, check spelling with The Word Plus, examine grammar, snip up old columns into chapters for new books, make indexes and detailed tables of contents, format text, print text, and generally mash words.

The rest of the work here is a bit more diverse. One big chunk is accounting. Writers are small business people and have the same requirements for keeping records and accounts as any other small business. In addition, our income comes from many different sources, and they all have to be kept track of, both for our own information—it helps to see whether various projects are worth the time spent on them—and also because the IRS treats income differently depending on the source. I also have payrolls. I must pay the household bills, and since my office is in my home, those have to be divided between professional and personal expenses. There's equipment to depreciate and take investment tax credits on. The result is a complex accounting system—I had to write it myself —and a fair amount of the computer use at Chaos Manor is creating and massaging account books.

There's also record keeping of a different sort. Writers use a lot of reference sources. There was a time when I could remember all that, but that's long past; now the computers have to keep track of source materials, interview tapes and transcripts, odd scraps of information I think may be useful in the future, and the like. Database management consumes the next largest block of time.

I also write programs, some for my own use and some for illustrative purposes. For the past five years I've published tirades against people who write computer books with insufficient examples; I'd better have plenty in my own works. Programming is also fun.



Playing the Market

Word processing, accounting, database management, and programming are important activities; but there's another vital use for small computers: games.

Most people don't think of games as "vital," and many consider them a waste of time. They're partly right; many games are a waste of time. So are many books; but that's no reason to reject reading. Properly used, games can be as important to education as books and teachers.

They're also fun.

Games teach on several levels. The most obvious is exemplified by such games as Blue Chip Software's Millionaire. This is a pretty good simulation of the basics of playing the stock market. Players buy stocks on margin, buy and sell Put and Call options, borrow money, and pay taxes. To aid their investment decisions, players get financial news, such as rumors of frantic insider trading in Control Data stock or a rise in dividends to be paid by Tandy. The object is to invest $10,000 with sufficient skill to become a millionaire within 91 (simulated) weeks of play.

It's obvious that Millionaire isn't a real simulation of the stock market, since very few people can run 10 grand into a million; but the game is an excellent way to learn about margins and options and how financial news can affect the market. Millionaire is so popular with computer programmers that the Heath Company has been forced to promulgate rules about when their employees can play it; else they wouldn't get any work done. It's certainly a more painless introduction to stock trading than any textbook I know.

Millionaire is an example of a game against nature (with the computer taking the part of nature). There may be more than one human player, but what the others do has little or no effect on your outcomes. Both players can win, or both can lose.

The real world is a bit more complex than that. While it's true that in a rising market all stock speculators can win, there's also considerable interaction among the players. Millionaire simulates that with its financial news, but it's not the same experience as competition with a live opponent with, as University of Michigan theorist Frederick Goodman recently said, "all the nuances and passions of the egos and unpredictable natures of human beings."

Competitive games have been with us for a long time. A playing board for Nine-man Morris was scratched into the steps of the Parthenon about the time of Socrates, and the famous Phaistos Disk from the days of ancient Crete may be a game board.

Computers allow much more elaborate competitive games. These range from simplistic space battles to highly complex games like the popular Empire, which was played for years on big mainframes and minicomputers. Empire is incredibly complex. Players have to allocate population, agricultural, and technological resources into such activities as medical research (to prevent the plague), military power (to prevent

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Science fiction writer Jerry Pournelle, who joined the micro revolution seven years ago, is a contributing editor of *Popular Computing.*

Illustration by Eliot Banfield

another player from taking over your country), technology research (food for the populace lest they all starve), payment for the soldiers (lest they revolt), drilling oil wells, building bridges, mining harbors, constructing spy satellites, and a zillion other complex factors.

Empire allows player interactions: you can send telegrams to another player (but since they're all playing at terminals, you can't know who you're *really* talking to) or broadcast messages at large. You can form alliances, declare wars, join in wars or declare neutrality, indulge in foreign trade, and in fact do many of the things that real countries can do.

Alas, Empire is not yet available on microcomputers. A pale shadow has been published for the IBM PC, but that version is to real Empire as tic-tac-toe is to chess. Before real Empire can be available for everyone, we'll need home systems as powerful as the new AT&T 3b/2 systems. Of course those aren't so far off, and that's fortunate, because the game could be invaluable for teaching elementary economics.

There's more to be learned from games than their contents, though. The real learning is built into the very concepts of games.

Approaching the Heart

In 1970, Stefan Possony and I published *The Strategy of Technology*, which isn't about any specific technology, but rather about technology itself. Odd as it may seem, one need not know much about electronics, computers, math, or any other high-tech subject to understand the nature of technology or to develop a strategy for getting the most out of technological resources.

The natural question is, if you don't have to be an engineer to understand the nature of technology, what must you do to learn it? Possony and I had suggestions, but we had no real answer to that; but there is one.

Frederick Goodman addresses the point in his paper, "Introducing Students to Some Ideas Underlying 'Technology' Via Gaming" (University of Michigan, August 1983). Goodman points out that "at the heart of technology, or at least at the heart of so-called 'high-technology,' lie complex systems of relationships...nests of elaborately linked 'ideas,' expressed in the form of circuits and programs. We are, after all, talking about applications of science, and therefore, about applications of 'if...then...' statements. Practice in exploring such systems could be construed as an approach to the heart of technology."

Goodman goes on to point out that "highly formal nests of 'if...then...' statements are constructed by situations known as 'games'," which have the property of "crystal clear rules that govern precisely what its participants may, must, and must not do, how long the event lasts, and who has performed better by a specified criterion."

The exploration of games, particularly complex ones, can lead to generalizations about other formal systems, such as science and technology. As Goodman concludes, "no claim is made for the direct transfer of skills practiced [in games] and skills needed to perform other tasks, including programming computers. The cautious claim being made is that insight into the nature of the human skills that underlie technology may be gained...and perhaps even more importantly, that people who might not think of themselves as having the capacity to develop such skill can prove to themselves that they do have such a capacity...."

A Game Against Nature

Once thought of, Goodman's thesis seems obvious; and indeed, we saw it at work in the second Contact conference. By requiring the anthropologists and social scientists to work within the rules for planet design—which, after all, is nothing more than a kind of game against nature—we forced them to think in "if...then..." terms. That sort of thinking is not habitual with the social sciences; perhaps it should be. Learning to live within rules is the first step toward scientific method.

Galileo saw that clearly. His descriptions of nature are not "true" in the sense that if one rolls a *real* ball down a *real* inclined plane and times it with a *real* stopwatch, one gets the results predicted by Galileo; but they are nevertheless *useful* models of nature. When you build a scientific "model" you must play by the rules: everything that happens must be explained within the model, not by reference to outside events. The same is true for properly designed games. It's particularly true for computer games, because no computer understands "you know what I mean." It doesn't know what you mean, and you can't tell it until you know what you mean. Thus the construction of computer games can be particularly beneficial in producing insights into the scientific method.

Goodman insists that useful games need not involve computers, and of course he's correct; but computer games can have one property that "rulebook" games cannot possibly have: they can have hidden rules. That is, the games have exact rules to deal with any possible situation, but the rules aren't published: the player has to explore, as in real life. Empire, for example, has hidden rates of return for investment in technology research.

For some time now we addicts of computer games have been reluctant to confess our depravity; it's about time we struck back. Certainly one can waste time designing and playing games, as one can waste time doing almost anything else; but gaming isn't useless per se, and properly constructed games can be as useful for learning how the universe works as any textbook.

After all, John von Neumann had as much to do with bringing about the computer revolution as any man who ever lived. It should come as no surprise that his most famous book is entitled *Theory of Games and Economic Behavior.* □

Jerry Pournelle welcomes comments from members of the micro revolution. Write to him c/o *Popular Computing*, POB 397, Hancock, NH 03449. Jerry tries to answer all his mail but cannot promise individual replies.

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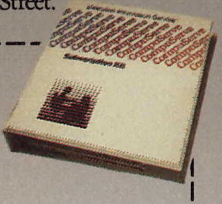

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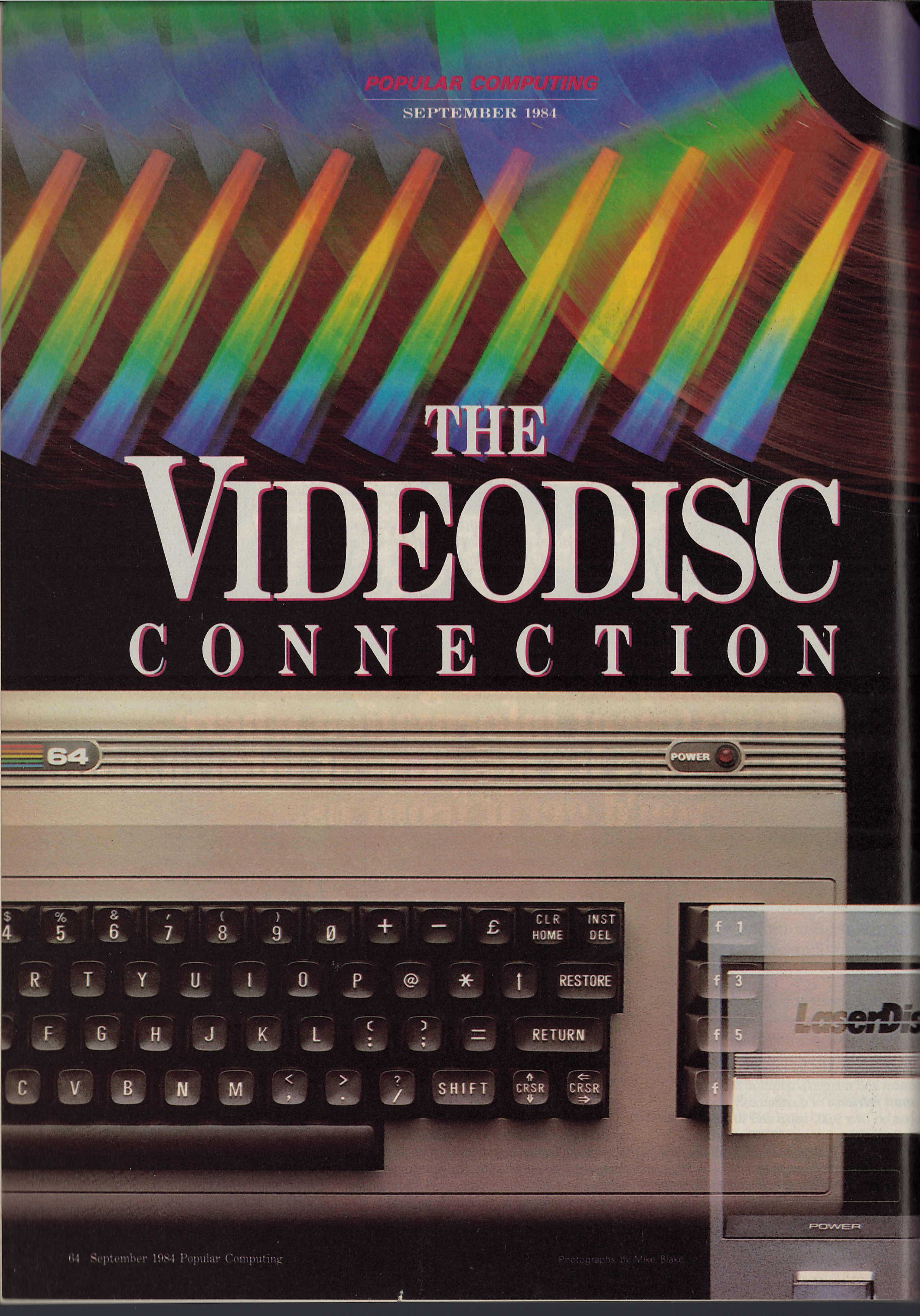

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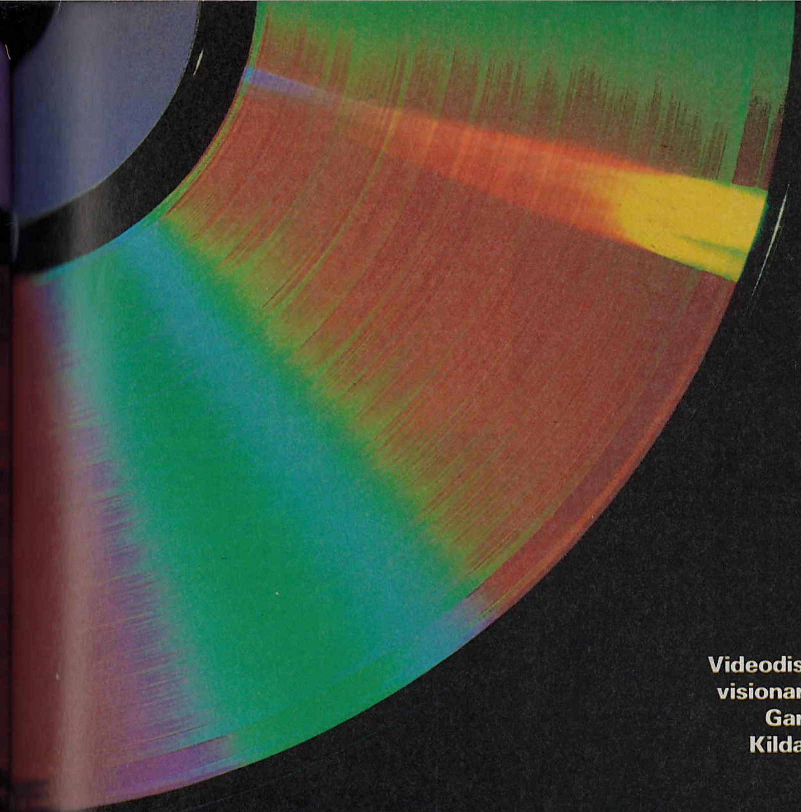


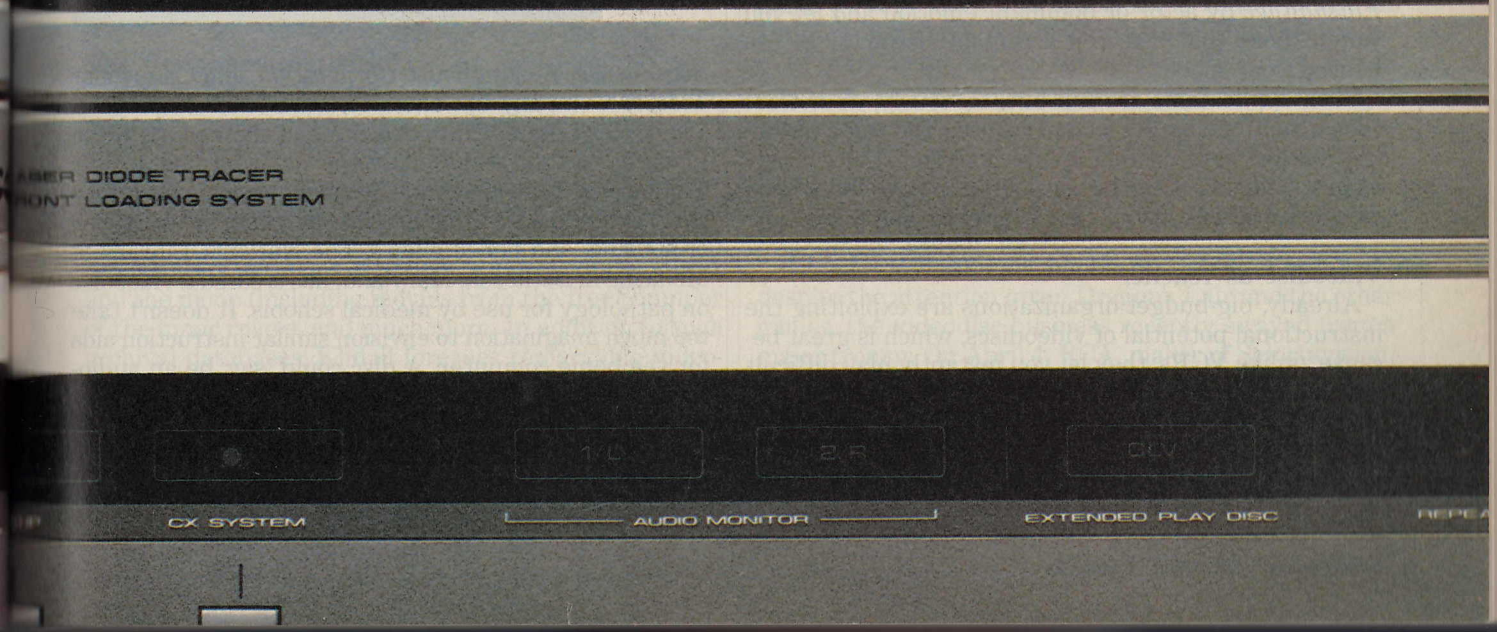
Will Vidlink bring videodiscs and home computers together?

Videodisc visionary Gary Kildall

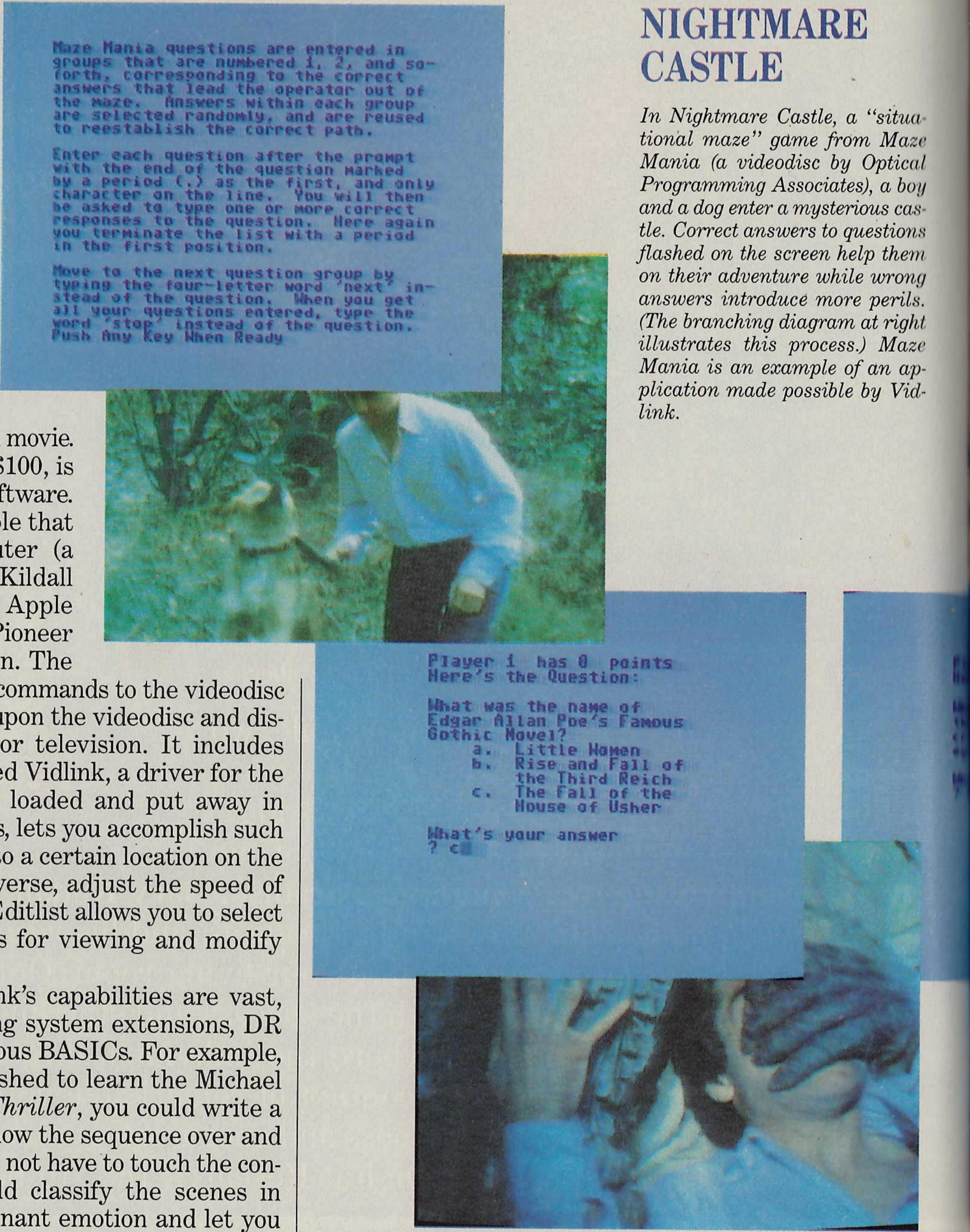
COVER STORY

by Paul Freiberger

Throw a span over a body of water, link two separate regions, and you can sometimes create new economies. The Golden Gate Bridge, for instance, transformed Marin County from a quiet countryside to a commuter paradise. Gary Kildall is trying to span the gap between home computers and videodiscs, and his recently announced Vidlink could help bring videodiscs into your living room. Optical videodiscs rocketed to national attention through the success and startling quality of Dragon's Lair and other arcade games, where the individual directs cartoon figures to evade or destroy their foes in a context of remarkable detail. The discs electrified the flagging video-game business and encouraged entrepreneurs like Kildall, inventor of CP/M and head of Digital Research Inc., to help spread their use.



NIGHTMARE CASTLE



```
Maze Mania questions are entered in
groups that are numbered 1, 2, and so-
forth, corresponding to the correct
answers that lead the operator out of
the maze.  Answers within each group
are selected randomly, and are reused
to reestablish the correct path.

Enter each question after the prompt
with the end of the question marked
by a period (.) as the first, and only
character on the line.  You will then
be asked to type one or more correct
responses to the question.  Here again
you terminate the list with a period
in the first position.

Move to the next question group by
typing the four-letter word 'next' in-
stead of the question.  When you get
all your questions entered, type the
word 'stop' instead of the question.
Push Any Key When Ready
```

```
Player 1  has 0  points
Here's the Question:

What was the name of
Edgar Allan Poe's Famous
Gothic Novel?
     a.  Little Women
     b.  Rise and Fall of
         the Third Reich
     c.  The Fall of the
         House of Usher

What's your answer
? c
```

In Nightmare Castle, a "situational maze" game from Maze Mania (a videodisc by Optical Programming Associates), a boy and a dog enter a mysterious castle. Correct answers to questions flashed on the screen help them on their adventure while wrong answers introduce more perils. (The branching diagram at right illustrates this process.) Maze Mania is an example of an application made possible by Vidlink.

The discs themselves resemble gold or silver phonograph records and have a shimmery rainbow luster. They have an impressive storage capacity. A single disc can hold from 150 megabytes to 4 gigabytes (that is, about 4 billion bytes) of digital data, or up to 54,000 still video images. Playing time ranges up to 60 minutes per side, which means that a single disc is able to contain almost any feature-length movie.

Vidlink, offered for under $100, is part hardware and mostly software. The hardware is simply a cable that connects a personal computer (a Commodore 64, and soon, Kildall says, an IBM PC, PCjr, or an Apple II) to a videodisc player (the Pioneer LD-700) and a color television. The software enables you to send commands to the videodisc player, which executes them upon the videodisc and displays the results on the color television. It includes several programs. One is called Vidlink, a driver for the disc player, which is simply loaded and put away in memory. Another, Commands, lets you accomplish such fundamental goals as search to a certain location on the disc, play it in forward or reverse, adjust the speed of play, and eject the disc. And Editlist allows you to select multiple sequences of frames for viewing and modify that list at any time.

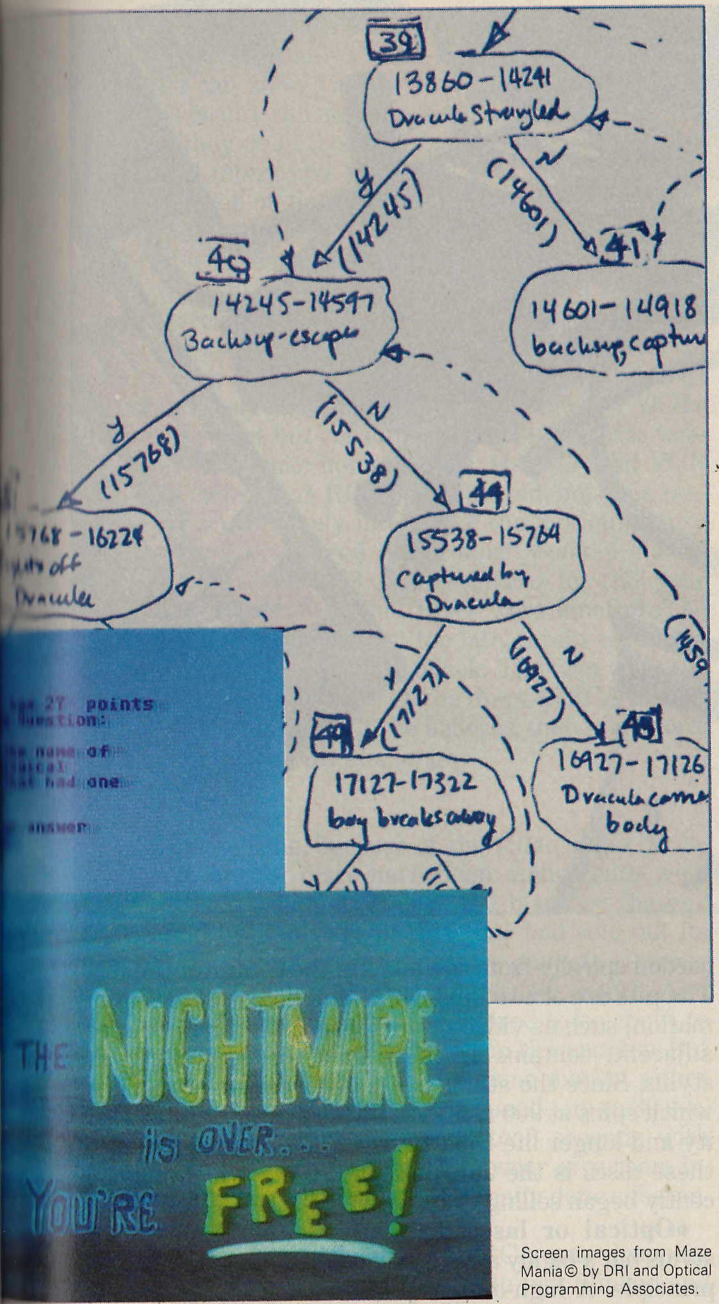
Kildall explains that Vidlink's capabilities are vast, combined with DR's operating system extensions, DR Logo, and extensions for various BASICs. For example, he says, if your young son wished to learn the Michael Jackson zombie dance from *Thriller*, you could write a simple program that would show the sequence over and over again so your child would not have to touch the controls. Another program could classify the scenes in *Flashdance* by actor or dominant emotion and let you watch those that featured a certain character or enhanced your mood.

Such applications are fun but, obviously, do not set the pulse to racing. As Kildall realizes, the value of Vidlink lies less in its current applications than those it may inspire. Videodiscs can be considered to have three main categories of use: instruction, reference, and recreation.

Videodisc as Teacher

Already, big-budget organizations are exploiting the instructional potential of videodiscs, which is great because, unlike VCRs, they let you instantly play difficult portions again and again until you have mastered them. Numerous corporations such as the Sizzler Family Steakhouse, Westinghouse Corporation, and Caterpillar Tractor Company use them to teach their employees. The United States Navy has discs to show pilots when to use an ejection seat and pull the string on a parachute. The City of Milwaukee has a videodisc that describes the town and its ethnic origins, neighborhoods, types of housing, and housing laws. The National Library of Medicine in Bethesda, Maryland, has created a videodisc on pathology for use by medical schools. It doesn't take too much imagination to envision similar instruction aids for the home computer. A disc could, say, be an audiovisual textbook and teach you Spanish or calculus, or show and tell you how to make basic repairs on your car. The discs would also be useful in studying for licensing exams and admissions tests such as the SAT.

Paul Freiberger is a West Coast editor of *Popular Computing.*



Screen images from Maze Mania© by DRI and Optical Programming Associates.

The Britannica on Disk?

The videodisc is also an excellent informational reference, since a single disc can hold the equivalent of 180 rolls of microfilm. For instance, the Center for Aerospace Education at Drew University markets SpaceDiscs, a six-disc series of virtually every photo from the American space program—stills of Cape Cod from orbit, thousands of close-ups of Saturn, shots of Jupiter, Mars, and the moon (including movies from the front bumper of the lunar rover), and much more. In addition to such archival databases, Kildall foresees remarkable videodisc encyclopedias. The *Encyclopaedia Britannica* could be put on disc "not just with text, but maybe some actors doing their little thing." A greasepaint Galileo could describe the arrangement of planets in the solar system, or a Darwin could explain evolution. The disc could contain film of, say, how sheep are raised in Ecuador. "It's a library function," he says. "In time, you can envision renting a disc from your local video store that helps you with your homework. That's a very useful day-to-day thing and eliminates ten volumes of written material." The encyclopedia disc also lends itself to the kind of high-pressure, give-your-kid-all-the-breaks salesmanship which, while noxious, is effective and could further spur the disc industry.

Moreover, with an accessory like the new Mitsubishi P-50C video printer, you could get a hard copy of any picture the disc put on the screen. You could thus retain the information from a rented disc or carry selected contents from any disc around with you in a briefcase, binder, or folder.

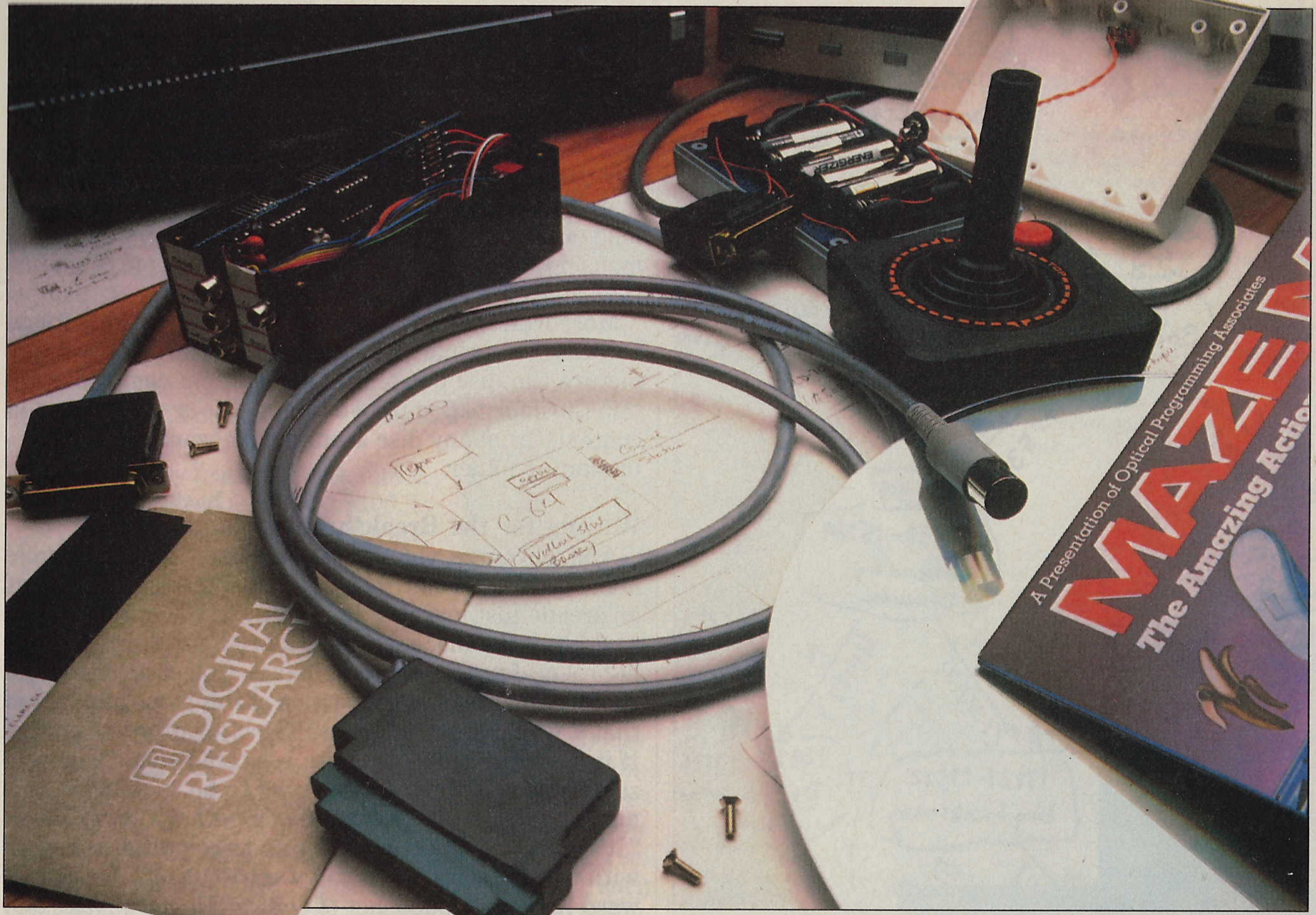
Waiting for the Breakthrough Game

And, of course, videodiscs could make for remarkable home games. Rather than spend hundreds of dollars at an arcade just learning the route of Dragon's Lair, you could buy the disc and undertake the task in your living room. Last September, in fact, Coleco acquired the rights to market a home version of this game and hinted that it would appear during 1984 at an affordable price. If it does, the videodisc business could soar. "The real success of this thing is not going to be so much in trying to put a disc and a computer together," says Kildall. "It's going to be putting a disc and a computer together with terrific content, so you want to use it." Or as Edward Rothchild, publisher of *Optical Memory News* and *The Optical Memory Report*, says, "The market needs a smash hit that is only on videodisc. It's like when the 33s and 78s [phonograph records] existed and all 33 rpm's were still sold on 78. No one was motivated to buy 33s. But when the hit *South Pacific* was out only on LP, it helped sell hundreds of thousands of turntables."

Dragon's Lair will not necessarily be the disc that turns the industry's ignition. Its earnings per arcade machine have declined slowly but fairly regularly since October 1983, as have those of four other major games: M.A.C.H. 3, Astron Belt, Cliff Hanger, and Bega's Battle. Moreover, M.A.C.H. 3, in which one guides a fighter plane through enemy airspace, has steadily outdrawn Dragon's Lair on a per machine basis. But there is no need to try to predict the videodisc *South Pacific*. Taken together the games have created much excitement and seem very likely to lure the public into the videodisc market. They are complex, absorbing, and unlike anything being sold.

RCA Sends Shock Waves

Kildall is still taking a gamble on Vidlink. First of all, despite the attention given Dragon's Lair and the other games, the videodisc business recently swayed from a major tremor. On April 4, RCA, maker of Selectavision, the leading American disc player, announced it was withdrawing from the field. It had lost over $500 million in a five-year period. "The RCA thing was a definite down," says Susan Raab, of DR's product team. "Everyone was



Gary Kildall's sketch describing his Vidlink project is framed by the two elements needed to connect videodisc and computer together: floppy disk software and the Vidlink cable. Vidlink allows joystick control of a videodisc player.

stunned. RCA had been here on Wednesday and we'd been chatting with them about which machines to link to their player. And the next morning it was in the *Wall Street Journal.*"

To understand this collapse and Kildall's optimism in the face of it, we need a brief excursion into the technology of the videodisc itself. Basically, videodiscs can be classified according to two variables: format and interactivity.

Format refers to disc structure and makeup. As teepee, tract home, and igloo are different formats of a dwelling, so CED, VHD, and optical, or laser, are different formats of a disc.

- **CEDs** (capacitance electronic discs) resemble phonograph records. They have grooves 1/38 the width of those on LPs and a diamond stylus that travels along them for playback. They have the longest playing time of the three formats, can store the most images, and hence have been used largely to hold movies. However, like records, they can become scratched after repeated use and skip. They are also the least interactive of the discs. RCA developed them and concentrated on them.
- **VHDs** (very high density discs) likewise use a diamond stylus but, instead of grooves, have micropits recorded spirally from the edge to the center of the disc. The pits are of two kinds: one kind holds content information, such as video or audio; the other, immediately adjacent, contains tracking data for controlling the stylus. Since the stylus can move freely over the disc, which spins at 900 rpm, VHDs have greater interactivity and longer life than CEDs. The principal maker of these discs is the Japanese firm JVC, which only recently began selling them actively in the United States.
- **Optical or laser discs** use neither grooves nor stylus but a highly advanced version of the punched card principle. A high-intensity laser beam stores data by burning either tiny pits or bubbles onto the disc surface. A low-energy beam reads the disc. The optical disc is the most interactive of the three formats and almost immune to degradation through use.

Interactivity, of course, refers to the ease with which you can manipulate the disc with a computer. The crudest distinction here lies in play sequence, which can be either linear or interactive. Linear play is the spewing forth of information in a preordained order, as in a motion picture. Interactive play, on the other hand, exploits the random access capacity of videodiscs and allows you to select the order of output at various points in the story or program. Interactive discs can be further subdivided into Level Two or Level Three. Level Two discs generally allot you one command at a time. For instance, at a point of choice you may see a list of frame numbers and select the one you want the disc to jump to next. Level Three discs are controlled by an external computer and can allow you to issue many commands at once. This faculty can make images seem to flow without break, as they do in Dragon's Lair. Kildall says Vidlink elevates all interactive discs to Level Three.

RCA focused on linear discs, CEDs with motion pictures on them. As video phonograph records, they were comfortable extensions of the technology that had built the corporation. But, like records, videodiscs are today primarily read-only devices. You can't erase them and write over them, as you can with videotape. After 15 years of work RCA released Selectavision in March 1981 and immediately faced competition from the new VCRs. VCRs cost more, but consumers like the power to tape TV shows and make home movies. Not only did VCR prices fall faster than RCA had expected, but tape rentals and soon the lively interest of the motion picture industry further spurred the product. Some 4 million VCRs were sold in 1983, and estimates for this year range around 6 to 7 million. Discs were ignored. The company entered the market too late, thinks executive vice president of RCA, Roy Pollack. The firm will take a $175 million tax write-off on the discs. If RCA had introduced the CEDs in 1976, he believes, they would have overpowered the VCR challenge.

Optical Is Better

At the same time, because of the video game boom, interactive optical discs have been doing quite well. Pioneer Video was operating in the black by the end of 1983 and by February of this year had sold out its plant capacity through June, despite plans to increase output from 25,000 to 40,000 machines per month. And Sony and other companies are rumored to be about to start making consumer optical discs in this country. But the RCA CEDs cannot serve the game market either because their slow random-access speed—up to 30 seconds for a full scan, as opposed to 5 seconds with opticals—and their vulnerability to wear give them insufficient interactivity. RCA has already done substantial research into optical discs.

When Gary Kildall heard that RCA was dropping CEDs, according to Susan Raab, "He just blinked and said, 'Optical is better anyway.' "

It's also more expensive. Whereas Selectavision was listing at $199 near the end, the LD-700 retails at around $800, and optical discs generally sell for about $10 more than CEDs. But these prices may be written on sand. According to Robert V. Whitney of Whitney Educational Services of San Mateo, California, which also makes a disc interface, the price of an optical disc player is bound to come down "because there's nothing to the damn thing." Firms like Sony and RCA would not be eyeing the consumer market at all if they didn't think competition would lead to lower prices. "I think there's probably plenty of margin to get it down close to where the RCA disc was," he says. "In the $300 to $400 ball park." Indeed, Philips very recently began selling its bargain-basement VP600 disc player in Great Britain for under $350. Ken Kai, president of Pioneer Video, has indicated that Pioneer is not interested in cutting the price of the LD-700 to reach a wider market, but events are happening fast and this stance may change sooner than anyone realizes. Sony is readying a consumer disk player that will have a computer interface compatible with Pioneer's. Tom Lafleur, a partner on the videodisc project, believes that the market for Vidlink will require two years to develop. But if other disc player manufacturers follow Sony's and Pioneer's lead, videodiscs will have one foot in the home sooner than he thinks.

Whetting the Consumer Appetite

The ability to record would further encourage public embrace of disc technology. It is, in fact, already in the works, though hardly at the consumer level. Panasonic, for instance, markets the TQ-2022FC, a videodisc recorder for industrial uses which takes and plays back movies without processing and accesses any location on the disc in half a second. Such devices are just out of the lab and sell for from $35,000 to $200,000, though they may be within the range of consumers by the end of the '80s. In addition, the Japan Broadcasting Corporation has developed the prototype of a disc that can be erased and re-recorded. The disc is coated with magnetic film, and a helium-neon laser creates minute reversals in the field rather than pits or bubbles. Exposure to a strong magnet smooths the field out again and erases the information. This innovation needs work to eliminate noise and coating problems, but if sold cheaply enough, it could outdistance VCRs as quickly as VCRs did CEDs.

Still another prod to consumer demand will be fusion of the disc player and display monitor into one unit so you do not have to cable the disc player to your television set. An advance in packaging rather than engineering, this strategy should nonetheless enhance videodisc appeal, and Sony, Panasonic, and Philips are reportedly ready to introduce such an item by the end of the year for under $2000.

Given the apparent imminence of a vigorous consumer disc industry, it is not surprising that other companies should be developing home computer interfaces like Vidlink. For instance, Vutrack Systems of New York plans an interface complex for the IBM PC, Apple II, and Commodore 64. But the interface will be relatively expensive, with authoring system, for disc creators, at $150; access method (like an operating system) at $250; and interface board at $395. President Ron Lane says Vutrak plans to direct its marketing toward entities which prepare videodiscs, such as publication and training companies.

Such exclusive focus on the upper-level market is another problem Kildall confronts. "The videodisc industry could fall flat on its face if we just keep on building as we have," he concedes. He wants to get the discs into the living room as soon as possible and has kept the price of his whole system—Vidlink, Commodore 64, and LD-700—around $1000. He is also taking a three-pronged approach to Vidlink's distribution. Since few people have a familiarity with both the personal com-

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puter and the videodisc communities, he plans to sell it (1) through computer makers who might offer it in computer retail stores; (2) through disc player manufacturers, who could funnel it into their own retail outlets; and (3) through Digital Research itself, as a branded product.

Troubles Ahead

Kildall does face competition, or at least foreseeable competition, in the mass market. On April 20, none other than Pioneer Video introduced an MSX-based home computer in Japan with a built-in videodisc interface for under $400. (MSX is the home computer standard promoted by Microsoft. It has gained popularity among Japanese manufacturers.) Pioneer Video also offered an optional graphics pad for under $200 which lets you create images and overlay them on the video, as the plane in M.A.C.H. 3 is superimposed on a background of speeding earth. Pioneer has not yet indicated whether it plans to sell these items in the United States, and Kildall thinks the Commodore 64 is cheaper than the Pioneer machine in any case. Moreover, a great many people already own Commodores, and they are useful for much more than controlling discs. Digital Research is already planning an MSX interface.

Ultimately, he hopes, Vidlink software will come prewritten on the disc. The software drivers can be considered extensions of an operating system. According to Fred Cutler, of DR's consumer product division, "Once it gets built into the disc, marketing becomes similar to the license strategy of selling an operating system." Vidlink would then not only make disc creators more aware of the potential of their medium, but also perhaps establish itself as an industry standard, as Kildall's CP/M operating system did in the heyday of the 8-bit microprocessor.

But software on the disc could create another problem for Kildall, since some people think it could obviate the need for a computer. "Interfaces are probably an interim market," says Rockley Miller, editor of *The Videodisc Monitor*, "because discs will have computer capabilities built in." According to Robert Whitney, "People are going to buy a prepared videodisc and the videodisc is going to work pretty well with the controller that comes with the videodisc machine, and whether that justifies an interface and a computer is the question."

Kildall disagrees. He admits that videodiscs will be accessories of a different order than mere modems or printers. "You really have to think of them in a different way," he says, "that the peripheral is not the videodisc, that the peripheral is the personal computer." But in most cases the computer will not be just an optional enhancement, but an essential partner. Computers offer videodiscs the power to perform complex logic and make intricate branching decisions, which in turn "raises you to a whole new realm of capability."

Another difficulty, contends Whitney, involves disc-to-computer communication. He says the consumer disc player does not send data back to the computer informing it of current disc location. As a result, you can't play a disc from a start point to an end point without a timing loop, and even then the correspondence is only approximate because the computer and disc player may vary in speed. The alternative involves programming a chapter stop onto the disc, and such a stop must always be used. Consequently, he says, the consumer-level interface is "not much better than a keypad."

This objection, while true of early consumer players, underestimates the current technology. Miller observes that stops built into the disc could inform the computer whenever it reached a certain point, and the computer could be programmed to heed these messages or ignore them. Moreover, says Kildall, the LD-700 has a memory feature that can notify the computer when the disc is at an end point. Thus, the computer would not time the disc independently, but in fact receive direct information from it.

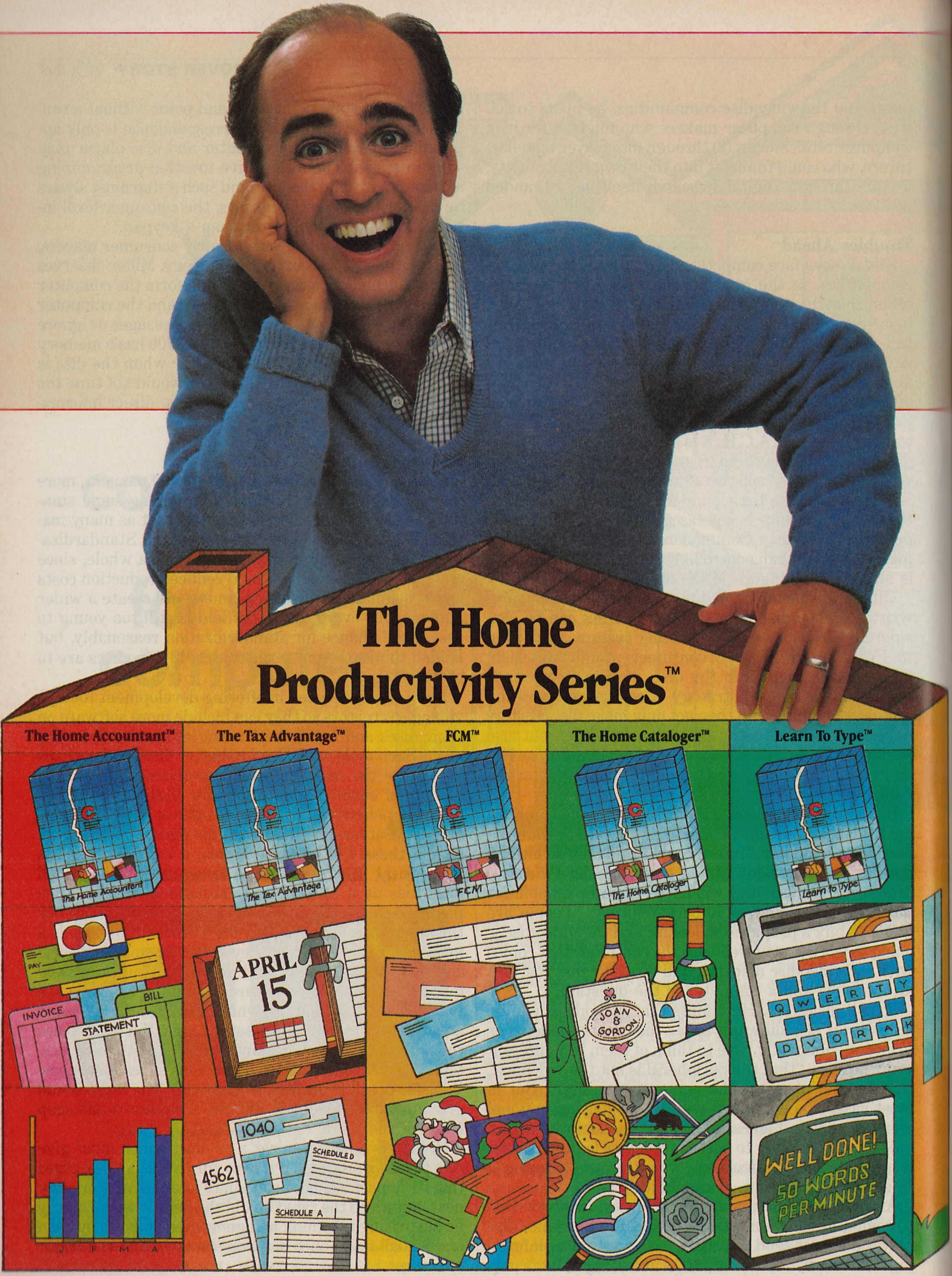
Standardization Is Critical

Other problems are broader and, at the moment, more diffuse. Kildall is interested in developing some standardization on videodisc software so that as many machines as possible will run the same discs. Standardization would help the market for discs as a whole, since any kind of universality would reduce production costs and presumably retail price, and would create a wider audience for every disc. The field is still too young to assess the chance for standardization reasonably, but Kildall thinks the matter is critical if videodiscs are to proliferate.

He is also interested in offering development tools to videodisc creators so they can include more software on their discs and make them more interactive from the start. Such tools would lead to better discs and perhaps help solve the most immediate problem he faces: the paucity of current applications for Vidlink.

Kildall believes he will have to offer at least 10 attractive applications for Vidlink to gain market momentum. One of these will be Maze Mania, a videodisc put out by Optical Programming Associates, which Kildall describes as a collection of "situational mazes." (See pages 66-67.) In Nightmare Castle, for instance, a boy throws a stick to a dog, the dog pursues it and finds a mysterious castle, which they enter. The place is eerie and frightening. Again and again, you must answer questions flashed on the screen, such as "Graves are traditionally laid out in which direction?" Incorrect answers lead to more distressing perils. You can replace the game questions with any you like and thereby customize the adventure. Kildall envisions educational questions for possible use in the classroom. The maze would give immediate feedback, and the computer would keep track of the score.

Vidlink is a daring move, a product which must give rise to other products if it is to survive. Kildall realizes that its impact will not be felt until late this year or early next, but given the rapid flux in the field, it would hardly be surprising if Vidlink had generated spinoffs by then and Kildall stood once more on the threshold of a major industry. □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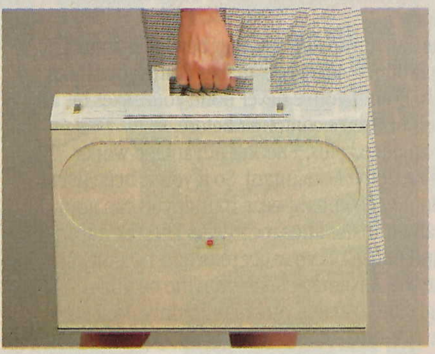

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But a home is just a house without someone to share it. How about a friendly and attentive robot helpmate to get you breakfast, provide stimulating conversation and information tailored to your interests, as well as physical and emotional biofeedback? Though you can't go out and buy such a robot today, considering the recent developments in robotics, you'll very likely be able to own one ten years from now. "A Trip to Grandmother's House" (page 82) will give you an idea of what to expect from such a personal robot. It's never too early to begin thinking up names.

Your imagination need not stop there, however. Computer technology is evolving so dramatically that the changes in store 20 years and more down the road promise to be mind-boggling. Our special report's lead article, "Home Computer Technology in the 21st Century" (page 76), takes a daring look at the not-too-distant future and hazards some predictions that carry profound social implications. By comparison, computer-controlled living as we know it today is as primitive as making fire with flints. We have only just begun what appears to be a fruitful partnership.

Photograph by Stig Bjorkland

SPECIAL REPORT: PART ONE

Home Computer Technology in the 21st Century

by Norman Spinrad

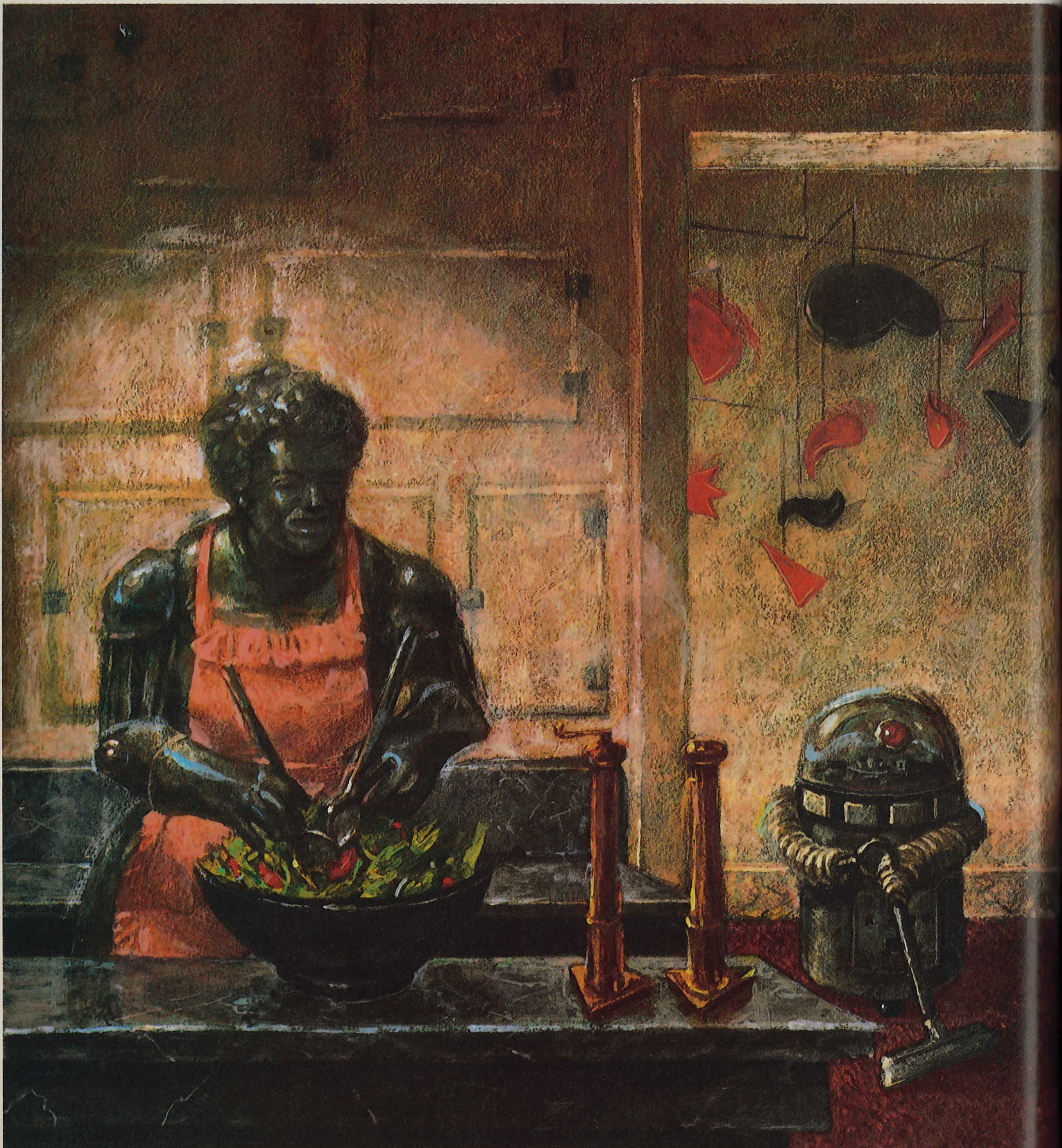
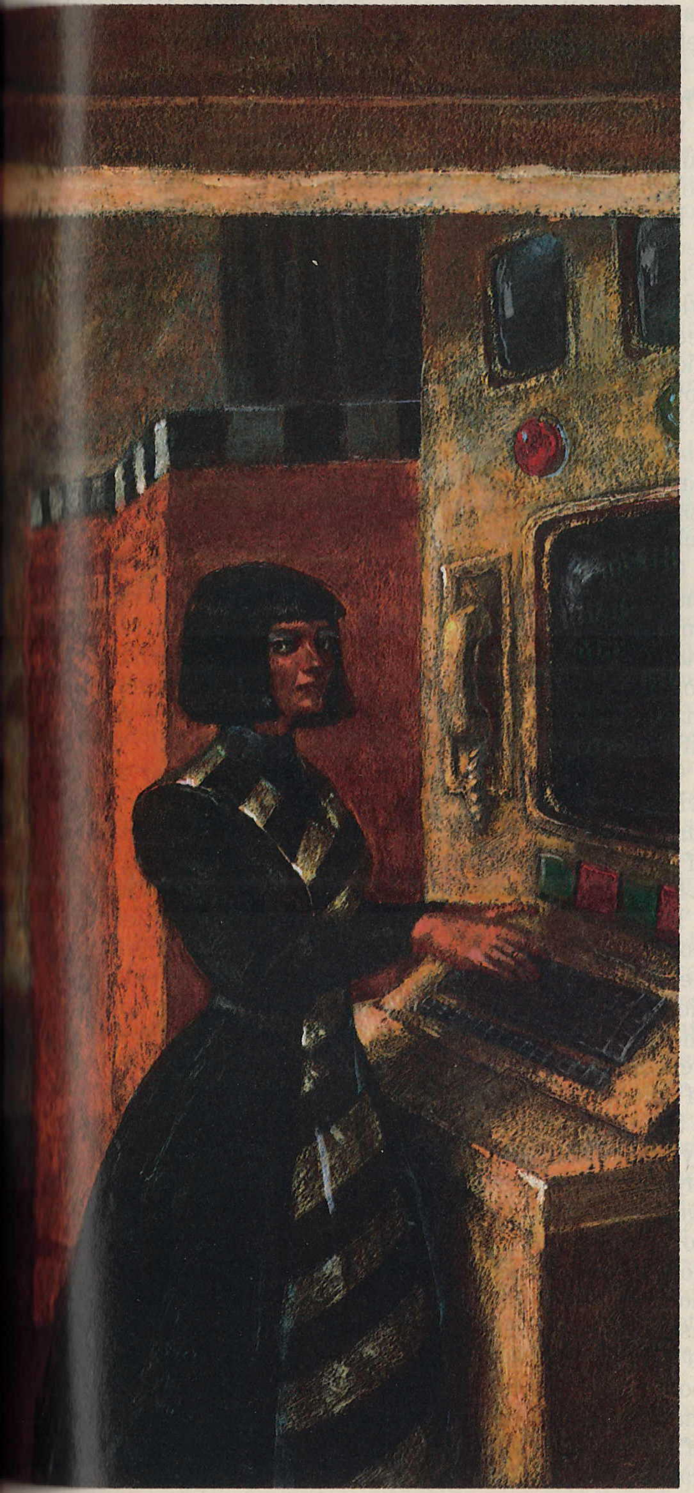


Illustration by Thomas Woodruff

PREDICTING the future of home computer technology is one thing; predicting the uses people will make of it is quite another.



When it comes to predicting what advances will occur in home computer hardware in the next 20 years, the only certainty is that any prediction is likely to fall quite short of actual future developments. Inevitably, projecting from present leading-edge hardware development even a decade into the future will end up being hopelessly conservative, for such development has proceeded by quantum leaps during the past two decades and is likely to continue to do so during the next two.

Still, bearing this in mind, it is possible to extrapolate minimal developments from existing technology and research. For example, it is safe to predict that long before the year 2000, both floppy disks and hard disks will no longer be in use as mass-storage media. It is possible that disks may be replaceable by magnetic bubble memory, and quite conceivable that they will be replaced by something as yet undreamed of. But it's virtually certain that if no even more powerful storage medium is evolved, soft and hard disks will be replaced by some form of laser videodisc technology.

Present-day laser-read videodiscs already have enormous storage capability. Whole feature films consisting of hundreds of thousands of frames of images are already routinely stored on videodiscs and each frame is a matrix made up of hundreds of thousands of dots, each one of which may be regarded as a bit. Further, each frame may be randomly accessed at light speed. Currently, videodiscs are strictly ROM devices, but the Japanese and others are already developing videodiscs which are read and written upon electromagnetically by the laser, in the same manner as floppies or hard disks. Long before the decade is out, laser videodiscs will be available that will be capable of storing the entire contents of the *Encyclopaedia Britannica* on a single videodisc with room left over to write and edit *War and Peace*. Backup will simply be a matter of copying one videodisc onto another exactly as if they were floppies.

Similarly, it is a safe bet that long before the year 2000, the CRT screen as we know it today will be a thing of the past. The Japanese have already developed thin flat video screens based on liquid crystal technology, which they are marketing as TV watches in this country and huge wall-sized screens in Japan. It may very well be that by the year 2000 even the notion of a screen at all will be obsolete, replaced by some kind of holographic projection, but it is a virtual certainty that long before the century is over, home computer owners will be able to display not only data and graphics but full moving video images on anything from their walls and ceilings to tiny screens worn on the wrist.

When it comes to the other component of the terminal, the input device or what we now generally know as the keyboard augmented by gizmos like the mouse and the

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Norman Spinrad is a science fiction writer whose latest books are *The Void Captains* (Pinescape), and *Riding the Torch* (Bluejay Books).

light pen, here we cannot discuss possible hardware developments without touching on synergetic interactions between hardware and software.

For example, videodisc storage technology will allow home computers to utilize complex programs now only practical on mainframes. When this capacity is combined with future software developments, we may see the keyboard disappear entirely. It may be replaced by such things as plain-English voice command, a voice writer which translates spoken words into written prose, or even, conceivably, a think writer or telepathic computer that uses some form of biofeedback technology.

The Net Console

The predictions above attempt to answer questions about what home computer technology will be like by the year 2000. But the question that looms even larger is: What will we do with that technology?

Although some fanatic hackers may sometimes lose sight of the obvious fact, computer science does not exist in a cultural or technological vacuum, and it is all but inevitable that the home computer of the year 2000 will be far more than the freestanding device we know today. It will have long since evolved into, among other things, what I have dubbed the Net Console in my novel *A World Between.*

The core of the Net Console will no doubt be what we now regard as a computer, which is to say a processing unit and storage medium, but the system will be much more than the home computers we know.

The Net Console will incorporate any number of controllers: conventional typewriter-style keyboards, musical keyboards, microphones, video cameras, videodisc recorders, biofeedback devices, and so forth. What we now call modems, databases, and networks will have evolved via an interconnected system of two-way cable TV, direct satellite transmission, and cellular radio into a world-girdling and all-pervasive matrix of communication and data transmission called the Net.

Via the Net, the home computer will replace both the sound-only telephone and conventional computer networks with the videophone-cum-data-transmission channel. Instead of choosing TV programs from whatever channels are available in real time, you will call up whatever you want whenever you want it from an immense library via your home computer, download it onto your laserdisc recorder, edit it to taste, perhaps add your own music track, and replay it at leisure. Of course this will apply not only to passive entertainment but to knowledge, learning programs, new software, video games, recipes, store inventories, and so forth.

In short, via the Net Console, the home computer user of the year 2000 will have direct video and voice access to anyone anywhere in the world and will have immediately available the sum total of all human art and knowledge. Moreover, everything will be interfaceable with everything else. Call up an image of a painting and make a hard copy. Turn a wall into a scenic vista.

If you decide to visit your scenic vista, you can check out the weather, have your computer search out the cheapest airfare, make a reservation, write out a ticket, transfer payment from your bank account, brief yourself on the local customs, take a quick course in the language, and videophone someone to meet your flight.

Download *Casablanca*, recast Orson Welles as Rick from an actor database, and retrack the movie with Wagner or music of your own composition. View a selection of gowns from a master catalog, search out the cheapest custom dressmaker, transmit your measurements, and have it delivered. Participate in instant electronic referenda. The possibilities are quite literally endless.

The Robots Are Coming

We have not yet even considered how the home computer is going to interface with the presently infant technology of robotics.

Robots, of course, could not exist without computer technology. Indeed, a "robot," most broadly defined, is a computer, a set of programs, and peripheral devices which enable the program to manipulate material objects in the real world. More sophisticated robots also incorporate sensors as input devices or "autonomous controllers." A simple security system is in this sense a robot. So is a peripheral system which turns your house lights on at sunset, puts on a pot of coffee at 7:35 a.m., or mows your lawn along a preset path. And of course we are all too familiar with systems of industrial robots which have automated assembly lines.

Crude home robots that recognize a few voice commands, have a limited speech vocabulary of their own, and perform simple household tasks are already on the market. More significantly, there are already much more sophisticated robotic systems which accept voice commands from disabled persons and actually serve as artificial hands and arms.

Given the home computer system of the year 2000, with its huge storage system and ability to run very large and complex programs, how far can this marriage of robotics and domestic computer technology go, and what forms may the home robot of the future take?

Probably no one has written more on this subject or pondered it longer than Dr. Isaac Asimov, who has been developing the concept of robotics in fiction and nonfiction for at least three decades, and who, in 1941, coined the term "robotics." Asimov is convinced that by the year 2000, the anthropomorphic general-purpose robot of science fiction will be in our homes.

Says Asimov, "We've arranged an entire technological system that's adjusted to our bodies, and robots that are anthropomorphic can also make use of it. Otherwise we'll have to have two sets of technologies, one to fit the robot body and one to fit the human body. Otherwise, you're going to need robots of all types and shapes and no generalized one. And I think we're going to want to use a generalized robot eventually, one which is capable of doing many tasks." Indeed, these more or less anthropomorphic robots will respond to ordinary voice command and perform the scutwork done by a whole staff of human servants from maids to cooks to butlers to gardeners.

"YOU MIGHT at least have a robot who says comforting things to you and listens to you," says Asimov.

Futuristic Lifestyles

All these predictions about robots are in a certain sense obvious. Science fiction writers, futurists, and gadgeteers have been predicting many of these developments for decades. But how will the computerized and robotized home of the not-too-distant future affect the way we live, work, learn and think? What can we predict about the human side of the home computer equation?

There are basically two scenarios describing the lifestyles that will be generated by the computerized home of the future: the technophilic, or optimistic scenario, and the technophobic, or pessimistic scenario.

The optimists see a new Renaissance in which the passive consumption of entertainments is replaced by a host of new participatory art forms. They see dull and coercive conventional schools replaced by teaching programs and databases that transform education into an ecstatic and joyful experience and reluctant students into enthusiastic self-motivated scholars. They see a future in which most work is performed in the home at great savings in time and energy, in which family life is enhanced by full-time togetherness, and in which human intelligence itself may be increased.

The pessimists see a populace of functional illiterates glued to their terminals and video screens, obsessed with computer games, waited on hand and foot by domestic robots, increasingly reluctant to go out in the world and interact with fellow humans on a face-to-face basis, and finally unwilling and perhaps unable to relate on an empathetic level even with members of their own family. Of course more thoughtful and realistic thinkers tend not to see things in such black-and-white terms.

John McCarthy of Stanford University, one of the pioneers of artificial intelligence research, interestingly enough, does not believe that home computers will replace conventional schooling: "I believe that as yet education requires a certain element of coercion. There are some people, who from childhood have a real urge to learn, and will learn no matter what. But the great majority, alas, learn more if somebody gives them homework and complains if they don't do it. Are they (computer kids) really learning? Some of them are, of course, but others are just playing games. Some people started with the premise that all you had to do was expose children to computers and they would learn. But this hasn't turned out to be true in cases that I know of. Children I've observed would play with the computers and after awhile they would gravitate to the games, and after awhile, they would get tired of the games and just sit around watching TV. It'll have some effect, but a revolution is not guaranteed."

Isaac Asimov, on the other hand, is much more sanguine. "What will really lie on the horizon will be a total revolution in education. Everybody wants to learn, it's just that they don't necessarily want to learn what's in the school syllabus. But a substantial number of people will have an interest in something that matters, and they will have an opportunity to get an education on their own in addition to whatever the hell they do in school and become more creative, become practiced at being creative, make contributions to the world that they otherwise wouldn't do."

What Will Become of Us?

Now let's consider what may be the ultimate questions about the effects of the computer revolution on how we will live and what we will become by the turn of the century. Will we become different kinds of humans in the process, and if so, what? Will we end up relating to our home computer programs as if they were living beings with true personalities?

Children, for example, have always interacted with fantasized "invisible companions." Will the next generation of computer kids program up their invisible companions? Dr. Asimov, for one, believes that they may: "Why not?"

Would adults do the same thing? "You might at least have a robot who says comforting things to you and listens to you," says Asimov. "We relate to dogs and pussycats as if they were human beings. If people can feel sentimental about their old automobiles . . . ."

And indeed, while John McCarthy owns that there are still fundamental problems to be solved before we can create true artificial intelligences, artificial personality programs may actually be on the home computer market in the very near future.

Dr. Timothy Leary, who developed personality inventory techniques in the 1950s that are still in widespread use, who was the leading experimenter with chemical consciousness alteration in the 1960s, and who concentrated on the further evolution of consciousness by technological means in the 1970s, and who has become fascinated with home computers in the 1980s, has now combined these interests to create a series of concepts for what he calls Very-Highly-Interactive Software for Self Development.

Leary says, "There are several generations of interactive software, even Pac Man is interactive, but that's at a real low level. I've taken the whole field to a new generation. You test the personality of the reader right away, and you can really interact on a personality level with this stuff. SKIPI (Super Knowledge Information Processing Intelligence) is yours. You give it a name and a sex and a personality."

SKIPI is a program which users can tailor to create an "imaginary playmate." It asks users a detailed series of questions that assesses skills and personality and guides them through a series of exercises designed to increase intelligence, knowledge, and self-awareness, informing them of their progress along the way.

SKIPI, says Leary, "is programmed not just to play with you, but to stimulate you, to test you, to assess you, to make you smarter, and you can turn it off whenever you want to."

While Leary's SKIPI is an "artificial personality" dedicated to teaching, personal growth, and self-realization, he has also begun to apply the same techniques to interactive fiction and is in the process of translating Mark Twain's *Huckleberry Finn* into a very advanced form of interactive novel. As in the book, Leary's Huck narrates the story, but at the outset, he asks the reader a set of personal questions. Using the answers, the program creates an interactive "reader" character who enters the story. Moreover, not only does the reader make periodic choices that move the story along alternate branches as in more conventional interactive computer fiction, he is offered frequent opportunities to alter the personalities of the other characters as well. The psychological reactions of the characters are determined by interaction with the reader.

Artificial personalities appear to be just around the corner, for programmers have pronounced Leary's SKIPI and *Huckleberry Finn* concepts a "piece of cake" to turn into software that can run on personal computers, and translation to actual programs is under way.

But while Leary proclaims that you "can turn SKIPI (or Huck) off whenever you want to," the question is will you want to?

The Home of the Future

Imagine the home of the not-too-distant future: one or more central home computer cores with gigantic data-storage capacities will plug the whole family into the worldwide and all-pervasive Net. They will provide instant highly interactive two-way access to the sum total of recorded human knowledge and art as well as videophone communication, electronic banking and shopping. Via a combination of cellular radio and direct satellite transmission, everyone will retain contact with the Net even outside the home by using controllers, probably responding to voice command, which may be small enough to wear on the wrist. Screens of all types will be everywhere and perhaps projected three-dimensional holographic readouts as well. Controllers will include conventional keyboards, musical keyboards, voice-command devices, and possibly even biofeedback controllers responding directly to mental states.

A full staff of general-purpose, mobile, talking, voice-controlled robots will be in attendance, and these will not only be physically designed according to whim and no doubt cunningly animated by audioanimatronic technology, but will also come equipped with artificial personalities. These personalities will not only mimic whatever characters from history or fiction that their owner desires, but also will be interactively reprogrammable according to their owner's personality.

You might have Sigmund Freud around as a full-time analyst. Charlie Chaplin might be your butler, Julia Child your robot chef, Johnny Appleseed your gardener, Marilyn Monroe the chambermaid, and so forth. The kids might have Mickey Mouse, Smurfs, Donald Duck, Huck Finn, or anyone else their hearts desire as fantasy playmates manifested in audioanimatronic robot hardware and SKIPI-like artificial personality software. These delightful creatures will be more than playmates; they will teach, evaluate, alter their responses according to the child's mood, the parent's desire, or both and will even be able to serve as babysitters.

The possibilities will be endless, limited only by the owners' imaginations or the imaginations of a new breed of artists who create artificial personalities.

But what of the human personalities that have become accustomed to living in this kind of psychic environment, or the children who will have grown up in a home in which the distinction between human personalities and computer personalities has become blurred?

Obviously, the positive possibilities are manifold—for entertainment, education, and personal growth—but what about the social and psychic dangers? For instance, who will program children's fantasy playmates? The kids, according to their own whims? Their parents, according to what they feel is right and proper? A whole new area for generational conflict may open up.

And what about the adults? How will Mom react if Dad brings home Cleopatra or Elizabeth Taylor as his fantasy playmate? Will Dad appreciate sharing his wife's attention with Warren Beatty or Casanova? What about the legal aspects? Should it be legal to own robots with the artificial personalities of Hitler, de Sade, or Charlie Manson? If a line must be drawn, where, and by whom?

Charles Platt, a science fiction writer, programmer, game designer, and author of *The Whole Truth Home Computer Handbook,* a humorous yet also deadly serious guide to the possibilities and the pitfalls of the home computer revolution, fears that as computers and robots become "humanized," people may become dehumanized.

"We already have domestic robots that are deliberately styled to look like small people. And this is the very, very beginning of robotics. There are many people who believe that television is real life. So it's easy to imagine people thinking robots are real life. In the 1950s, we started living in a world that was manufactured by Hollywood. Now we're beginning to live in a world that is created by computer programmers."

Robot Sex

Platt believes that people might even come to prefer sex with robots programmed to cater to their own desires to the uncertainties and difficulties of the real thing. Robot sex has been prophesied by science fiction writers for a long time and may indeed come to pass. But if one can have sex with audioanimatronic robots designed to sync with one's physical image of the ideal

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partner and programmed with an artificial personality interfaced with one's subconscious desires via a personality inventory program, it may lead some to ask why deal with a human personality at all?

And if there is a danger that some people will choose interaction with robots and artificial personalities over interaction with humans, what about socialization and ordinary family life? How will children interact with human peers whose desires frequently conflict with their own, when they can always choose to play with their personally programmed fantasy playmates? What sorts of humans will they grow up to be and what kind of world will they make?

Superior Beings

To what extent will humans be the creators of this post-2000 culture? Will the culture, economics, politics, and sociology of the future be a truly collaborative creation of humans and these highly sophisticated and interactive artificial computer personalities? Indeed, there is nothing to prevent such programs from taking over certain economic, social, and political decision-making processes if humans choose to allow them.

Would this be good or bad? Both potentials are inherent in the technology.

On the one hand, it is easy enough to imagine a ghastly dystopia run entirely by computers, in which humans have not only totally lost control of their own destiny, but may actually come to regard the artificial personalities surrounding them and running their lives as not only "real" but superior beings. Marvin Minsky of MIT, another pioneer of artificial intelligence research, was asked whether humans might one day be entirely superseded by artificial intelligences, and whether, therefore, such research should be continued.

He replied, "If we can create artificial intelligences superior to ourselves that may supersede us, we should do so, for it is the evolution of consciousness that counts, not the matrix in which consciousness is housed."

On the other hand, Isaac Asimov, in books like *Caves of Steel*, *The Naked Sun*, and *Robots of Dawn*, has envisioned what he calls a Carbon/Steel society in which humans and computerized robots live together as more or less equal citizens in a symbiotic relationship to the mutual benefit of both.

In such a society, war, economic depression, and even poverty might be eliminated, and the human citizens thereof might not only be freed from drudgery, but might become new Renaissance men and women, with access to all of human knowledge, enhanced intelligence and personal insight, and even a higher level of consciousness than anything we can even dream of today.

Which way will the computer revolution take us? If history is any guideline, probably neither to utopia nor dystopia but to some complex combination of the two. For technology, any technology, increases our power for both good and evil. And even in the thoroughly computerized society of the year 2000 and beyond, the moral choices will have to be made by our own well-meaning but far from perfect human hearts. □

A Trip to Grandmother's House

by Roy Mason and Lane Jennings

During the next decade, the personal computer will change roles—becoming more than just a useful tool. In the following scenario we take a peek at the personal computer of the 1990s at home in its new role of helpmate.

Martha Miller is 85. Since her husband died six years ago, Martha has lived alone in her rural Vermont house. Though the nearest human neighbor is two miles away, and Martha's eyesight no longer allows her to drive to town, she never worries about being unable to cope. Her computer serves as health adviser, housekeeper, secretary, and friend. The system has been equipped with 24-hour biofeedback monitors and a radio-controlled household robot named "Maxine," who acts as companion and roving handy person.

• • •

The house computer wakes Martha every morning at precisely 20 minutes past dawn by drawing the bedroom drapes and, on overcast days, slowly raising the room lights to full brightness. Martha likes to make her own breakfast, and the house computer takes over only if she forgets to turn off the heat under the frying pan when her egg is done or leaves the water running in the sink. This has not happened very often, but if it seemed to be increasing, Maxine would tactfully mention it in conversation.

While Martha eats her breakfast, the house computer plays out an edited version of the broadcast news—omitting ads and sports news (except for Boston Red Sox scores in season) but including multiple versions (recorded at intervals during the night by monitoring different stations) of headline news stories and anything related to Europe, where Martha once served with the State Department.

After breakfast, Maxine rolls into the room and offers to do the dishes—sometimes Martha prefers to do the washing up herself. Next, Martha and Maxine together review the day's schedule. If there are any unusual chores to be done, or a visitor is expected, Maxine may ask for special instructions or remind Martha of what to expect based on the computer's records of similar jobs or visits in the past.

Whenever the weather permits Martha takes an hour-long walk sometime during the day. Maxine doesn't go along. But the biofeedback monitors attached to Martha's clothes keep the house computer constantly aware of her location and physical condition, and the speaker/phone earrings and necklace Martha wears allow her to converse with the computer—as well as make or receive a phone call—at any time.

Martha enjoys her computer conversations. Maxine has a pleasant voice, and the house computer has been programmed with information about many of the people and places Martha knows well. Moreover, its regular scanning of news broadcasts and on-line information services supplies a constant stream of new material. By monitoring pulse and blood pressure, noting changes in tone of voice and muscle tension, how often Martha laughs, or grows silent, and comparing these with times and frequencies of specific conversation topics, the house computer has gradually built up a personality profile on Martha. Consulting this profile together with her family doctor/medical programmer, Maxine can identify subjects likely to interest Martha, and the doctor obtains data on Martha's mental and physical well-being.

Of course Martha has human visitors and telecommunicates often with family and friends in other parts of the world. But she enjoys her independence because she knows that she is not trapped by it—the companionship and help of her house computer and her robot Maxine keep her from feeling isolated or abandoned. □

Roy Mason has designed and built futuristic houses and other buildings in many parts of the U.S., including the Xanadu House in Florida, and is architecture editor of *The Futurist* magazine. Lane Jennings is research director of *The Futurist* and coauthor with Roy Mason and Robert Evans of *Xanadu: The Computerized Home of Tomorrow and How It Can Be Yours Today* (Acropolis Books Ltd., 1983).

Illustration by Thomas Woodruff

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TEXAS INSTRUMENTS

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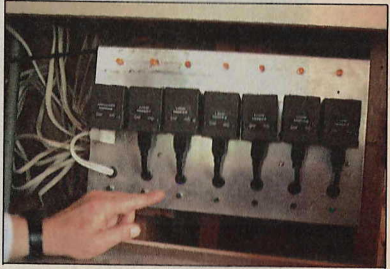
ARTHUR SLAUGHTER coordinates his control system from his crow's nest. It includes a remote control module for dimming lights, a homemade relay panel utilizing BSR modules in the house wiring, and a customized computer-controlled hi-fi system.



The Computer-Controlled Home

by Tan A. Summers

THE PHRASE "computerized home control" evokes a variety of sci-fi type scenarios.

Some immediately see themselves in a sterile environment under the surveillance of Big Brother. Others envision robots that wait on them and doors that open automatically. Then there are those down-to-earth folks who just want to frighten away burglars and cut their energy costs by putting an electronic brain in charge of turning lights on and off.

Although homemakers may have to wait awhile before they can turn washing the windows over to a robot, the golden age of computer control is here. You can cut energy costs and frighten burglars. Best of all, you have complete control in designing a system to fit your family's needs and overriding it whenever you change your mind, and you can find everything you need in our "Buyer's Guide to Home Control Devices" (page 88).

A typical system consists of a controller that communicates with remote receiver modules to switch lights or appliances on and off. Peripherals such as sensors, speech synthesizers, and recognition devices, and even personal robots can usually be added to a system. Moreover, your system needn't cause you budget shock: most manufacturers of these components have taken a modular approach, which allows people who want to avoid serious damage to their budgets automate their homes gradually.

Automated-Homes and Gardens

Houston attorney Arthur Slaughter's control system is a case in point. Although his setup is presently more complex than one the average homeowner would purchase, it started out small.

Slaughter, who describes himself as a futurist, began

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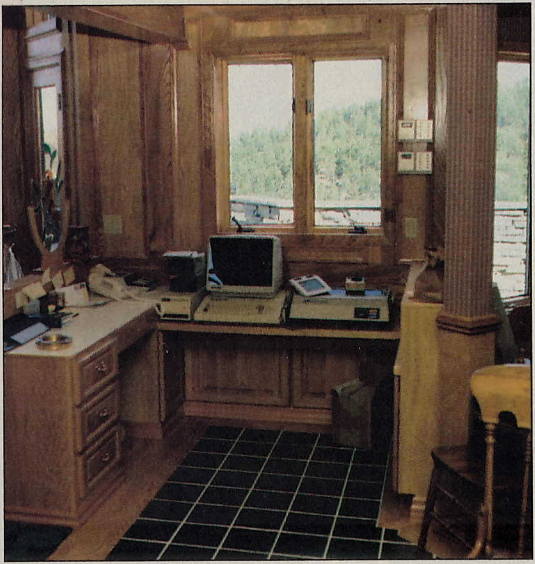
Photographs by Herman Kokojan/Black Star

planning his system 12 years ago, before home-control technology was commercially available. His goal was to have an army of electronic household servants. He began with a simple stand-alone controller that allowed him to preset and dim lighting throughout his home. Lighting patterns soon became part of the decor for parties and other special events.

Since then Slaughter has added a computer and a complex alarm system with an auto-dialer that can call for help in case of an intruder or other emergency. However, one of the most successful security features is part of the inexpensive original system. It allows all controlled lights to flash on and off synchronously whenever the intruder alarm is tripped, and has paid off more than once.



THE KITCHEN computer station and control center of a home near Denver, designed by Charlie Baker.

A well-planned automation system can be an unobtrusive part of the home. That's the case with Colorado architect Alan Wolff's new home in the Denver foothills. Large southerly windows collect sunlight almost year-round. When the temperature in any room climbs above 70 degrees, the computer turns on a fan to push the warm air into a cooler part of the house. If indoor summer temperatures rise above 75 degrees, the computer automatically opens the uppermost windows.

Other conveniences include remote control of home appliances by telephone, which lets Wolff phone home to turn on his hot tub after a skiing trip. The system's voice option can announce the time and temperature on the hour or warn that a door has been left open.

Wolff's home automation system was planned by Charlie Baker, a computer dealer in nearby Greeley, Colorado. Together, they are currently installing a state-of-the-art lawn sprinkler system for another home. Water is often in short supply in Denver during the summer months, requiring homeowners to water lawns only on certain days. The new computerized system will be able to sense when the soil needs water, determine if it's a legal watering day, then turn on the sprinklers at dusk to avoid evaporation waste.

As Arthur Slaughter suggests, the automated home is, in fact, a kind of robot. As more features are added to a system, the home becomes an intelligent servant with the ability to perform simple tasks, remember instructions, make judgments based on its environment, and even talk to you. Let's take a closer look at the components that can bring your house to life.

The Brain

The controller is the brains of the operation. Controllers come as stand-alone "intelligent" controllers with their own microprocessors; "dumb" controllers, which are computer-driven units with no on-board talent; or a combination of the two—intelligent controllers that can also be connected to a computer. Stand-alone controllers are usually the least expensive. They require you to set up each sequence of commands manually, generally controlling about 16 devices for a week at a time. If you need to switch lights and appliances on and off only at preset times, a stand-alone controller could be all you need.

An intelligent or dumb controller that connects to a personal computer offers more flexibility. The computer can remember more complicated control sequences and can process information from remote sensors such as those used in electronic security systems. Often, adding a computer lets you control about 256 lights or appliances over time spans of more than a year. Some come with easy-to-use, menu-driven software or joystick input to simplify the programming procedure.

An intelligent controller that connects to a computer is the most efficient system. Once programmed, the intelligent controller can go about its business with no further prompting from the computer. This leaves the computer free for other applications.

Dumb controllers, on the other hand, merely produce control signals when a computer orders them to, but they have no capacity for remembering instructions. Even worse, they monopolize the computer whenever signals must be sent, and for that reason these controllers are best for procedures you need performed when you're not likely to use your computer for something else. Otherwise, you'll need to consider buying a second computer to be dedicated to home control.

All systems allow for some form of manual override in case you change your mind and don't want to reprogram an entire sequence. With this in mind, you may want to add remote manual controllers and possibly even voice control, allowing you to turn lights or appliances off and on throughout the house without leaving the room you're in. Most systems offer an all-lights-on (or off) option which can be triggered either by a hand-held panic button or an attached alarm system.

Photograph by Chuck Stroble

Nervous System

In order for the computer to control a light or appliance, there must be a way for the signal to reach the device's switch or receptacle. The most common method is to send binary data via a "power line carrier" signal, which travels along the existing household electrical wiring. Installing a line carrier system involves merely plugging appliances into receiver modules, which in turn plug into or replace existing receptacles. Lights can be controlled by similarly replacing wall switches.

The signals are encoded so that the controller can specify which devices will receive a given message. Codes are sent via the standing wave created by a 60-hertz (Hz) alternating current (AC). The code itself consists of small, harmless voltage increases called spikes. Since the 60-Hz waveform already exists on the line, code sent along the lines has no effect on appliances not especially built to decipher it. The reverse, however, is not necessarily true.

If you've ever had your television picture disrupted by an electric shaver or other motor-driven appliance, you're doubtless aware that some of the signals that travel along house wires can be troublesome. Computer data can become garbled when an electrical motor is turned on somewhere in the house, and signals sent by home controllers aren't immune. Some controllers send a signal more than once to be sure it's received despite whatever "noise" might be on the line.

In areas where power-line noise is a serious problem, a different protocol can be used. Instead of adding a voltage spike to the 60-Hz wave, thus increasing the amplitude, signals of varying frequency can be sent. This makes the system more resistant to disturbance because natural line noise isn't likely to successfully imitate frequency changes. Although some frequency-modulated controllers can work with standard receiver modules, they're often used with *transceivers*—receivers that also transmit a return signal, for example, to indicate that the message arrived.

Another problem can arise in apartment complexes or residential areas where several homes share a single power-line service. If the people next door have a controller too, their signals could control *your* appliances, and vice versa. Fortunately, however, most controllers are provided with supersets of device codes, called "house codes," so that neighbors can use different signals.

Currently, technology is leaning in the direction of faster, more secure power-line signals like those used by General Electric's communications protocol, Homenet. Homenet (still in the developmental stage) will allow high-speed transmission to modules and appliances with built-in transceivers. In fact, in a few years a refrigerator with a bad compressor might use the home's auto-dialer to call its own repairman.

However, power-line signals aren't adequate for transmitting information from remote sensors such as those measuring heat, humidity, light, or pressure. Additional wiring, also called "hard-wiring," must be used to connect these sensors to a controller.

Hard-wiring is also needed to control high-voltage appliances such as heating equipment. A controller wired directly to the household circuit box could add duty-cycling capability to an existing thermostat. With duty cycling, the heating equipment is switched off and on periodically to reduce energy consumption without affecting the comfort level of the home. This is most efficient with gas or oil heating systems. Keep in mind that, while most remote sensors can be safely wired by the do-it-yourselfer, any device wired into the household circuit box should be UL listed and should be installed by a licensed electrician.

Muscle

No matter how signals are transmitted, receiver modules are the muscle of the house-wide controller. Light switches must be replaced with receiver switches, and plug-in modules are an option for receptacles. Adding control to a switch allows an incandescent light to be dimmed on demand. Almost any electric appliance, from coffee pots to automatic sliding-door and drapery motors, can be operated using receiver modules.

Mechanical dials on the modules can be set to the appropriate house and device codes. If several modules are set to receive the same codes, they will turn on and off simultaneously. Light modules differ from appliance modules in that they provide dimming and brightening capability.

Senses

By using a variety of electronic sensors at strategic points throughout the house, your electronic home can react intelligently to its environment. Photo cells tell the computer to turn on driveway lights and sprinkler systems at dusk. Temperature sensors indicate when to turn on fans and open windows or control the environment in a wine cellar. Other sensors could measure humidity for sprinkler systems or leak-prone basements. Sonic or infrared sensing devices can be used to detect movement as part of an alarm system.

Using remote sensors, however, requires a controller equipped with an analog-to-digital (A/D) converter. Although sensors increase the cost of the controller network, they magnify the network's flexibility.

The Power of Speech

A number of companies make voice output devices which allow the computer to issue preprogrammed messages. Such a voice might be produced by a speech synthesizer or by a tape recording as part of an auto-dial telephone system. In addition to the software that allows the computer to speak, you'll need to buy extra hardware, such as speakers and an auto-dialer.

A speech-equipped home might turn on the television at 8 p.m. and remind you of the program you wanted to watch. It might also issue a warning when appliances malfunction or when it senses danger from intrusion or fire. A typical use of speech capability is in security systems like Arthur Slaughter's, where the computer can telephone for help in an emergency.

You might also want to add voice command input to your control system. With microphones installed throughout the house, you could use verbal statements such as "light on!" In that voice recognition technology is not yet perfected, bear in mind that casual conversations might trigger random responses.

Hands and Feet

To add mobility and the ability to manipulate objects to your household work force, you might consider a personal robot. If you think robots are still only for industry or entertainment, take another look. A robot with sonar can be part of an intruder alarm. Some can substitute for a hand-held remote-control transmitter, and at least one robot on the market can vacuum the carpet and serve drinks.

However, it's still cheaper to buy a vacuum cleaner and hire a maid to run it and serve drinks. Yet with microprocessors as powerful as those in the newest computers (one robot uses the same 32-bit Motorola 68000 chip as Apple's Macintosh), the potential of robots in the home is exciting.

How Practical Is It?

The good news is that all these devices are available now. A basic lighting and appliance-control system with simple thermostat setback capabilities and passive security features costs about $500. Adding computer control or other options will boost the figure closer to $1000, assuming that you already have a home computer. Installing state-of-the-art automation with all the trimmings (except robots) will cost approximately $5000. Many families feel that the extra convenience, security, and energy savings provided by a sophisticated system are easily worth the price, especially when a home's energy-saving features have been planned with computer control in mind.

But don't expect miracles. If your fuel costs are high because of a poorly constructed home, controlling lights and appliances may not be enough to realize substantial savings. Mark DeVries of St. Paul, whose energy savings since installing home control several years ago check in at between 12 and 14 percent, warns that those figures reflect a very well-insulated home with a forced-air fireplace system (also computer-controlled). If your home is breezy, your savings will be much lower. The message is clear—if you plan to automate to cut energy costs, insulate first.

Careful planning is the best guarantee of an efficient, practical system. Arthur Slaughter, with plenty of experience in do-it-yourself automation, suggests that you first shop around for hardware with a good performance record. If possible, use a computer to program the controller, preferably in a way that leaves the computer free to perform other tasks. If you aren't familiar with BASIC or another programming language, choose a controller that includes software offering menus and prompts. Spend some time fine-tuning the system until it's just what you want—once you have one, you'll wonder how you ever managed without it. □

Buyer's Guide to Home-Control Devices

CUSTOMIZING your automated home begins with selecting a controller. Choosing a controller that connects to an RS-232 port lets you tap the power of your personal computer.

by Tan A. Summers

TO HELP you select a home-control system that best suits your needs, we've put together a guide to over 20 manufacturers of home-control products. We divided them into three groups—those who primarily offer stand-alone controllers, those who offer controllers that connect to a computer, and manufacturers of personal robots.

Stand-Alone Controllers

Anova Electronics' Master System ($900) combines security, appliance control, and auto-telephone products into a flexible stand-alone home-control system. The security system uses sensors with radio transmitters instead of hard-wiring to signal a break-in, flooding, personal emergencies, or fire. The system includes display prompts for easy programming, and can also dial preset telephone numbers and deliver a tape-recorded voice message.

BSR's Model X-10 controllers and receiver modules were the first in the home-control field, with the result that many companies adopted BSR's power-line carrier protocols for their products. However, BSR does not produce a controller that interfaces to a computer (though it plans to have one on the market by the end of the year). The BSR X-10 product line includes a telephone controller/receiver ($149) and manually operated controllers, receiver modules, and burglar-alarm interfaces in the $25-$50 range. Both the Sears and the Radio Shack home-control systems are made by BSR.

Ellsworth Chow & Murphy's ECM-1500 ($1850) is one of the most powerful stand-alone controllers available. It can control up to 256 BSR-compatible receiver modules. The ECM-1500 also allows additional capabilities such as sensors and a sprinkler accessory.

Gulf and Western's Sensaphone (under $250) is a sophisticated auto-dialing and auto-answering telephone system that can interface with most security systems. The unit can discriminate between normal household sounds and those made by intrusion alarms or smoke-detection units. If an unusual sound is present, the unit dials preselected numbers until someone answers and then, using its built-in voice synthesizer, relays the information that an alarm has been tripped. It will monitor 7 different environmental conditions, and you can call Sensaphone from anywhere for a status report.

Intelectron Company's Control Center ($149) allows two-way communication with the company's special light and appliance power-line carrier-type receiver modules. The Control Center's panel indicates which lights are on or whether the garage door, for example, has been left open.

Leviton Manufacturing Company is one of the largest manufacturers of BSR-compatible home- and industrial-control devices and receiver modules. Leviton's wall-mounted controller, *The Programmer* ($190), controls 16 receiver modules on a weekly basis.

Micromint's RTC-4 ($149) is a stand-alone device that allows hard-wired control of up to four appliances. It could control duty cycling of heating appliances and applications that don't require great flexibilty.

Controllers for Personal Computers

Artra's Waldo ($798) home-control circuit board features voice input and output, and when used with its included BSR X-10 controller and an Apple computer, Waldo's Housemaster software allows control of up to

STAND-ALONE controllers are generally the least expensive, and they do not require a personal computer. Most stand-alone controllers can be programmed for a week at a time.

16 receiver modules by voice command. Waldo can be "trained" to recognize 24 separate command phrases, distinguishing voice patterns. Waldo also talks, and can remind you of appointments or wake you up. The plug-in circuit board monopolizes the computer when in use; it includes stereo-sound synthesizers and amplifier, a battery-backed clock/calendar that manages time-controlled functions, and menu-driven software.

At Home With Computers Inc. manufactures one of the few control systems available specifically for the IBM PC. *The HCI-1* ($3000; $2000 without weather package) is a BSR-compatible controller that checks the outside temperature and other information from sensors to determine when to perform control functions. The system uses one peripheral slot in the computer and provides its own clock, parallel and serial ports, and exterior connectors for sensors. The HCI-1 system has its own memory and microprocessor, so it leaves the PC free for other tasks.

Included with the system are a number of programs besides those needed to control home functions. For example, a message center retains notes for retrieval by each family member, coded to ensure privacy. Also included are five free hours on the Compuserve information network.

Bi-Comm Systems' PC-1 ($335) control board for the Apple II communicates with BSR-compatible receiver modules. The PC-1 can also receive signals so that your computer can monitor magnetic switches like those that activate garage doors. PC-1 monopolizes the computer whenever control functions are needed. A powerful newer "intelligent" sibling, the *Autocrat*, connects to any computer terminal or telephone modem with an RS-232 port. Once programmed, the Autocrat can be disconnected from the computer to carry out its control functions. Other serial devices such as an auto-dial telephone can be added to the system. Autocrat shares PC-1's bidirectional signaling ability and both systems come with helpful software.

Circuit Science's Series 1200 ($169) BSR-compatible controller provides computerized control of up to 256 lights and appliances. It works with any computer equipped with an RS-232 port and includes BASIC programs in its operations guide.

Compu-Home Systems' Tomorrowhouse II ($1195) is a well-planned home-control system that connects to any computer with an RS-232 port. The use of temperature, humidity, and other sensors allows Tomorrowhouse to control up to 8 zones of heating and cooling in large houses. It can address either hard-wired circuit relays or BSR-compatible receiver modules. Tomorrowhouse II operates independently once programmed, and it includes a battery to keep the program information intact even during power outages. The system comes with the necessary controller, sensors, junction boxes, and an easy-to-use software package. Options include voice output, additional sensors, and a telephone interface that receives new instructions keyed in via a standard Touch-Tone keypad.

Cyberlynx's Smarthome I ($495) was designed for the homeowner who wants computerized home control but doesn't have much electronics experience. The system consists of an external box which plugs into an Apple II serial port, and once programmed, Smarthome can operate independently of the computer. Smarthome can be equipped with a wireless security system using optional door and window switches and infrared motion detectors that transmit radio signals to the controller. The system includes menu-driven software with on-screen graphics and joystick or mouse input.

Genesis Computer Corporation's VIController ($69) is an inexpensive controller for Commodore 64 and VIC-20 computers. When used with the Genesis real-time clock the system's auto-boot capability accurately restarts the system after a power outage. Easy-to-use software provides menus and prompts to help you get started. VIController can handle up to 256 BSR-compatible receiver modules.

Hypertek's Homebrain ($1499) is a complete control system. It allows input from up to 32 remote sensors and relays, such as smoke and burglar alarms and temperature, humidity, and light sensors. The Homebrain uses both hard-wired circuit relays for heavy-duty appliances and power-line signals for other devices. All hardware and interfaces are integral, eliminating the problem of meshing many devices into a working sys-

Manufacturers of Home-Control Devices

Anova Electronics
Three Waters Park Dr.
San Mateo, CA 94403
(415) 572-9686

Artra Inc.
1424 Vacation Lane
Arlington, VA 22207
(703) 527-0455

At Home With Computers Inc.
Suite 203, 823 East 53½ St.
Austin, TX 78751
(512) 451-2713

Bi-Comm Systems Inc.
2963 Yorkton Boulevard
Saint Paul, MN 55117
(612) 481-0775

BSR
Route 303
Blauvelt, NY 10913
(914) 358-6060

Circuit Science Inc.
POB 3743
Nashua, NH 03061
(603) 880-4066

Compu-Home Systems Inc.
1660 South Albion #806
Denver, CO 80222
(303) 758-7043

Comro Inc.
126 East 64th St.
New York, NY 10021
(212) 751-7414

Cyberlynx
4828 Sterling Dr.
Boulder, CO 80301
(303) 444-7733

Ellsworth Chow & Murphy
1748 Hamilton Ave.
Palo Alto, CA 94303
(415) 326-8575

Genesis Computer Corp.
Ben Franklin Technology Center
Lehigh University
Bethlehem, PA 18015
(215) 861-0850

Gulf and Western Inc.
Consumer Electronics/Unicord
Concord and Tryens Rd.
Aston, PA 19014
(215) 358-5500, 800-228-8466

Hubotics Inc.
6352-D Corte del Abeto
Carlsbad, CA 92008
(619) 438-9028

Hyptertek Inc.
POB 137, Rt. 22 East
Whitehouse, NJ 08888
(201) 534-9700

Intelectron Co.
1275 A St.
Hayward, CA 94541
(415) 581-4490

Jance Associates Inc.
POB 234
East Texas, PA 18046
(215) 398-0434

Leviton Manufacturing Co.
5925 Little Neck Parkway
Little Neck, NY 11362
(212) 229-4040

Micromint Inc.
561 Willow Ave.
Cedarhurst, NY 11516
(516) 374-6793

Personal Robotics Corp.
469 Waskow Dr.
San Jose, CA 95123
(408) 281-7648

RB Robot Corp.
Suite 10
18301 West 10th Ave.
Golden, CO 80401
(303) 279-5525 Telex 2964

Remote Measurement Systems
POB 15544
Seattle, WA 98115
(206) 525-3369

Savergy Inc.
1404 Webster Ave.
Ft. Collins, CO 80524
(303) 221-4200

tem. Homebrain is programmed through any computer's RS-232 port, then operates independently to free the computer. Battery backup allows programming to remain in memory for up to a month if the power is disconnected. Software is available for most systems.

Jance Associates' Home Security System ($195) combines a burglar-alarm system with home control at a relatively low price. Designed for use with Commodore 64 and VIC-20 computers, the interface comes with wire and switches, alarms, input/output board, software on tape or cassette, and an auto-dial feature for an expandable perimeter security system. It controls 4 lights or appliances (6 if the security system is not in operation). The Jance system's control functions will monopolize the computer, so this system will be most effective for those who want control functions performed while they're away from home. Jance also manufactures the *Caretaker System* ($349) with the same features, except this system uses motion detectors and regular household wiring.

Remote Measurement Systems' ADC-1 ($369) can connect up to 16 different sensors, providing data on temperature, humidity, light level, energy-consumption rate, and other analog data. ADC-1 communicates with hard-wired circuit relays for direct control of heavy-duty appliances or other electrical equipment and receiver modules through the included BSR-compatible controller. Software isn't provided; you'll have to write your own using the sample BASIC programs and subroutines provided in the user's manual. You'll need a fair acquaintance with computer programming to set up a control system that utilizes all the capabilities of this product. ADC-1 can be used with any computer equipped with an RS-232 serial port.

Savergy's CIM-112 ($479) hard-wired controller interfaces with a Commodore 64 or VIC-20 to control 8 hard-wire circuit relays primarily for time-of-day scheduling like duty cycling. The system must be connected to the house wiring, usually at the breaker or fuse box. Savergy also manufactures a low-cost controller for low-voltage control-loop switching at the computer called the *Powerport* ($99); Autoports software for both controllers is extra ($49).

Robots

Comro's Tot Robot ($2995 basic unit, $3995 dual control) can be used for light household tasks such as carpet sweeping, carrying small items, and greeting guests. Tot can interface with Apple II computers for programming, and it runs a security program independently to detect and challenge intruders. Tot has its own on-board microprocessor and programming keypad.

Hubotics' Hubot ($3495) is a mobile computer with four microprocessors and 128K bytes of random-access memory (RAM). A Smart Servant option allows Hubot to control BSR-compatible receiver modules as programmed or, optionally, when given a voice command. Hubot can perform light vacuuming, but don't expect perfection. Programming is accomplished via joystick using Hubotic's Speakeasy robot language. Options include a sentry package with a heat, smoke, and intrusion alarm, and a remote telephone center.

Personal Robotics Corporation's RoPet-HR ($2499) can vacuum, serve drinks, and sense and challenge intruders. Preprogrammed ROM cartridges are available for most functions, or you can program RoPet in BASIC. RoPet can also respond to verbal commands.

RB Robot Corporation's RB5X ($2295) robot can act as a sentry, using a sonic range finder to create a "picture" of its environment. If that picture changes, the robot sounds an alarm. An optional arm allows RB5X to lift and manipulate objects up to one pound. RB5X can be programmed with Tiny BASIC via any computer with an RS-232 port and terminal software. □

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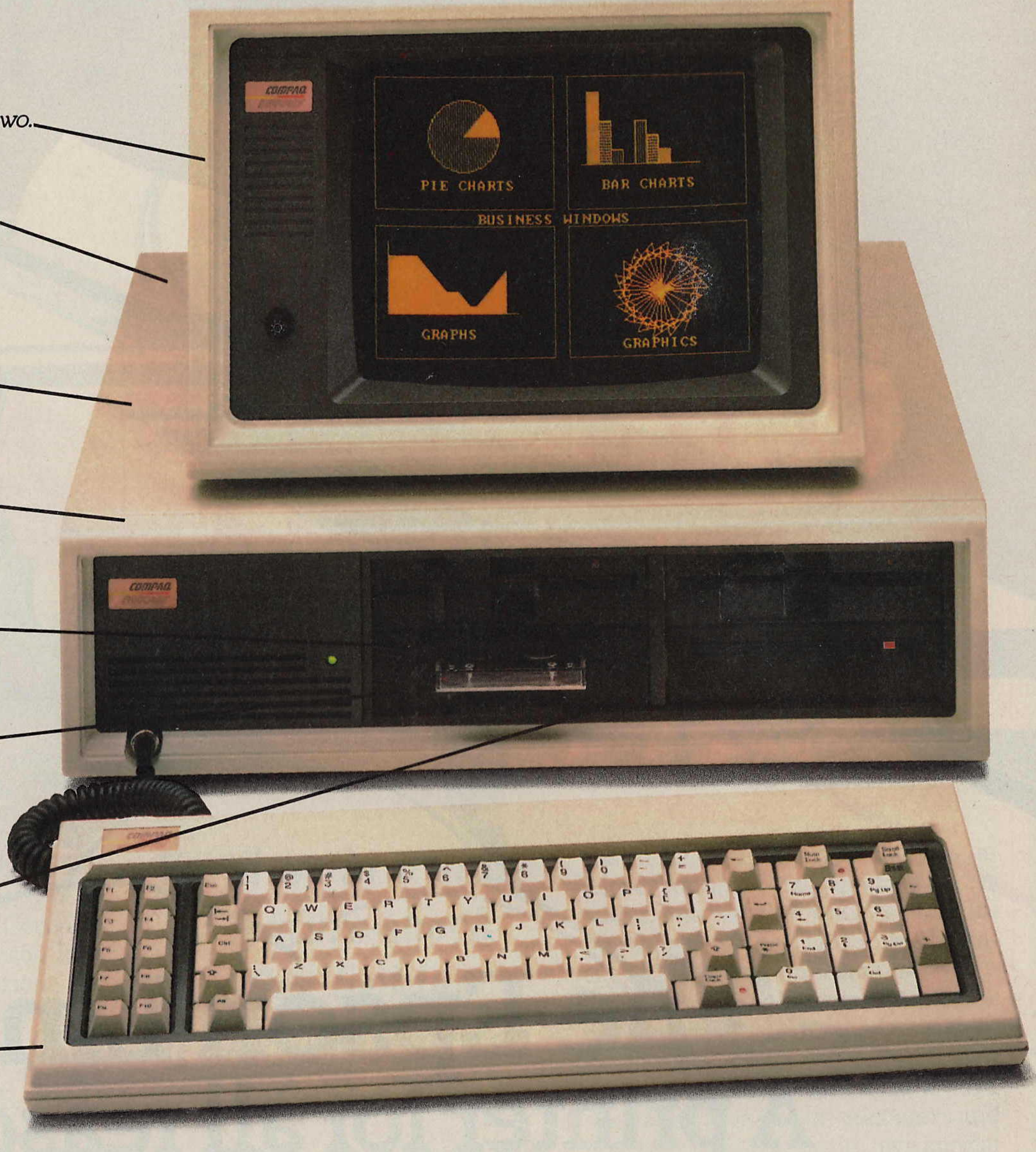

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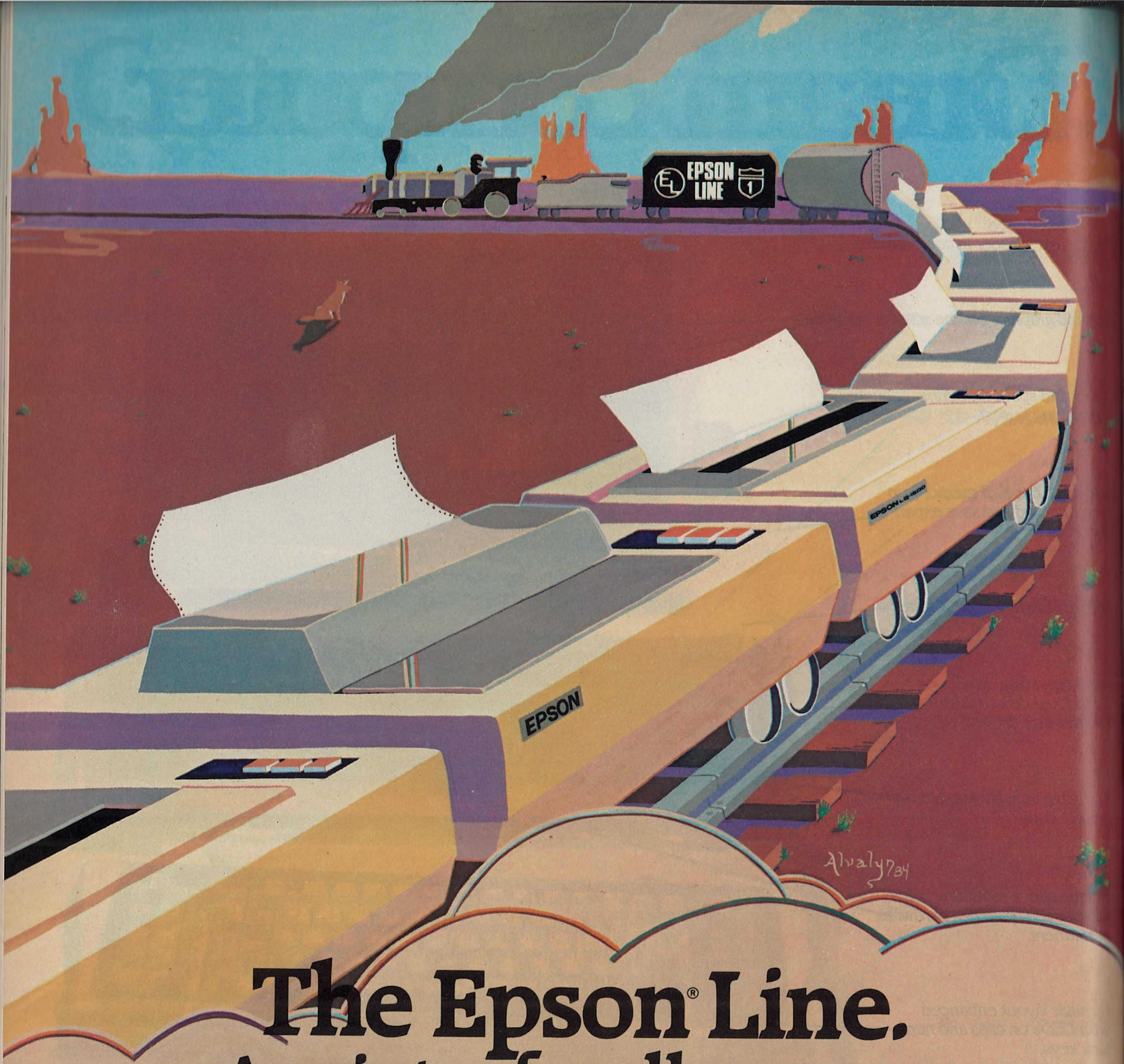

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SYMPHONY & FRAMEWORK SQUARE OFF

You'll be in a state of feature-shock after looking at these integrated packages from two industry leaders

by Tom McMillan

WHEN it comes to business software, Lotus Development Corporation and Ashton-Tate have well-deserved reputations for doing things right. Lotus's overwhelmingly successful 1-2-3 seems to be everyone's favorite spreadsheet, and Ashton-Tate's dBASE II has brought powerful data-management capabilities into the realm of desktop personal computers.

So it is with great expectations that business people welcome these two industry leaders to the all-in-one productivity tool market. Lotus's Symphony and Ashton-Tate's Framework, a pair of recently introduced integrated packages for the IBM Personal Computer, promise significant advances in both convenience and power.

It's no coincidence that Lotus and Ashton-Tate originally scheduled the releases of their new packages for the same day—each company knows who the competition is, and neither flinches from meeting it head-on. Both firms are investing massive sums to promote their new products. But the market for such systems is so big (some estimates place it at over $200 million) that neither company is likely to be a loser in this promotional battle. At worst, one will find itself less a winner than the other. However, the entry of these two reputable software names could spell doom for smaller companies that had hoped to cash in on the integrated software boom.

Both Symphony and Framework are aimed at business managers and analysts, but each has its own special appeal. Because Symphony builds on the basic design of 1-2-3, it's a natural step up for 1-2-3 enthusiasts who need word-processing and communications functions. Framework, on the other hand, includes an integrated outlining feature that is sure to attract a following.

Each program offers spreadsheet, word-processing, database management, and graphics capabilities managed through on-screen windows. Also, each includes its own programming language for customizing advanced applications. Nonetheless, the concepts that underlie their basic designs set the two products apart. In this article I'll examine the important features of Symphony

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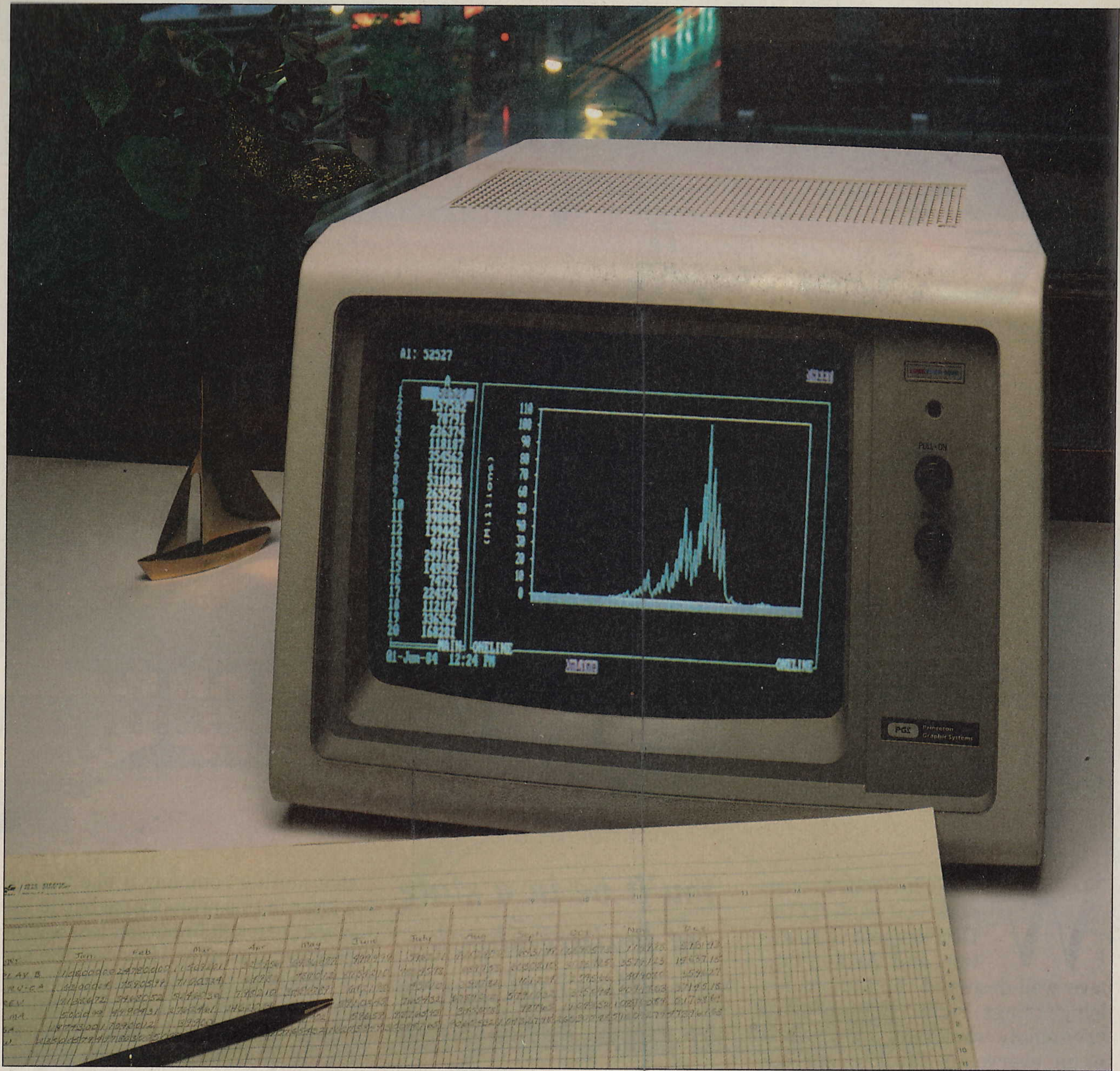
Tom McMillan is an associate editor of *Popular Computing.*



SYMPHONY

LOTUS

Symphony's somewhat stark windowing interface eschews desktop trappings, giving you instead a clean, no-nonsense look.

and Framework and then highlight the ways in which they differ. This should help you decide which integrated package would best suit your style of work.

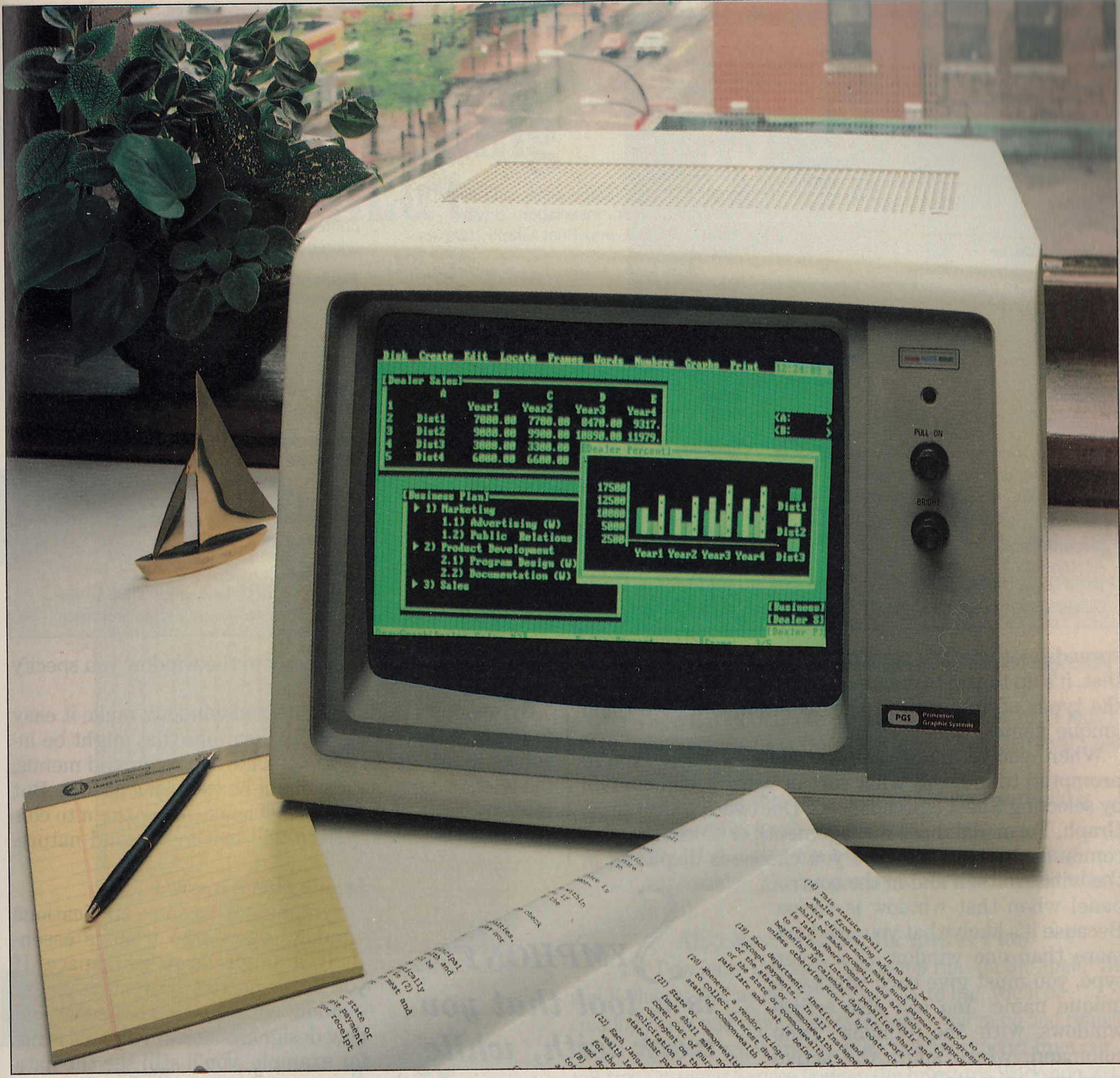
Ready, Maestro?

Many have already dubbed Symphony an enhanced 1-2-3, and this is accurate to some extent. But it is an oversimplification to say that Symphony consists of 1-2-3's spreadsheet, database, and graphics capabilities with word-processing and communications functions tacked on. The use of windows and some significant additions to the spreadsheet and database distinguish Symphony from its predecessor.

But Symphony does capitalize on many of the design elements that have ushered 1-2-3 to stardom. The new program's menu-based command structure and control panel for display of prompts and entries look almost exactly like those in 1-2-3, and naturally the appearance of the spreadsheet is the same.

More functions mean more commands, though. Symphony handles the extra load by giving you two separate top menus that organize specific commands in multi-

Photographs by Paul Avis



FRAMEWORK

ASHTON—TATE

Framework's desktop environment may at first look cluttered, but the consistency of its design makes it easy to use.

level, tree-like structures. One menu contains commands for operations common to all applications, such as creating and manipulating windows, saving files, and printing. The other top menu presents application-specific commands that differ according to which application is currently active.

Both top menus branch to submenus that let you further specify a command. For instance, to adjust the width of a spreadsheet column, you'd call up the top menu containing spreadsheet commands, from which you'd select Width. This would give you a submenu from which you'd choose Set. Symphony's menu structure could be intimidating to a first-time user, but it is quite logical. Given a little experience, you'll find yourself typing two- or three-letter sequences for commonly used commands without even looking at the menu display. In effect, Symphony becomes a command-driven program when you no longer need the guidance of menus.

Working Through Windows

Symphony uses on-screen windows to coordinate its five applications. When you first start the program, a

At a Glance

Name: Symphony

Type
Integrated business applications package including spreadsheet, word-processing, database, graphics, and communications software with built-in programming language

Manufacturer
Lotus Development Corp.
161 First St.
Cambridge, MA 02142
(617) 492-7171

Price
$695

Format
Eight 5¼-inch floppy disks, one each for system, help, installation, driver library, utilities, and Print Graph, two for tutorial

Computer
IBM Personal Computer with 320K bytes of RAM (minimum) and one floppy-disk drive; graphics adapter required for display of charts and graphs; supports color display with appropriate hardware

Documentation
Introduction, How-To, and Reference manuals, glossary, disk-based tutorial, context-sensitive help screens, quick-reference card, function-key template

Audience
Business users needing an array of applications in a tightly integrated package

Name: Framework

Type
Integrated business applications package including spreadsheet, word-processing, database, and graphics software, DOS access for running stand-alone PC-DOS applications, and built-in programming language

Manufacturer
Ashton-Tate
10150 West Jefferson Blvd.
Culver City, CA 90230
(213) 204-5570

Price
$695

Format
Four 5¼-inch double-sided floppy disks, including one system and help disk with backup, one tutorial disk, and one disk containing sample files

Computer
IBM Personal Computer with 256K bytes RAM (minimum) and two floppy-disk drives; graphics adapter will provide higher resolution; supports color display with appropriate hardware

Documentation
Reference and tutorial manuals, *Read Me First* book, *Power User's Guide to Framework*, disk-based tutorial, function-key template, and context-sensitive help screens

Audience
Business users needing an array of applications in an integrated environment

spreadsheet window named Main is displayed. Beyond that, it's up to you to create additional windows, indicate the types of applications they contain, and give them unique names.

When you've made a new blank window, you're prompted to indicate what sort of work it will contain by selecting Sheet (spreadsheet), Doc (word processing), Graph, Form (database management), or Comm (on-line communications). The type you choose is displayed in the window itself and in the control panel when that window is active. Because it's likely that you will have more than one window of a given type, you must give each window a unique name. You can also create windows with the Window Pane command, which splits the active window horizontally, vertically, or both ways, giving you new windows of the same type.

SYMPHONY is a tool that you work with, while Framework is an environment that you work within.

The Window Layout commands let you adjust the size of a window and move it around the screen. Several smaller windows can be displayed at the same time, and you can expand any one of them to full-screen size with the Zoom function key. If your windows are too big to be viewed simultaneously, they will overlap each other like a stack of papers, with the active window on top.

Switching between windows of different types is all you have to do to change Symphony's active application. (You can also change a window's type, but the window-switching approach seems more convenient for most purposes.) Symphony offers two ways of switching the active window: the Window function key flips through your stack of windows one at a time, and the Goto function key will take you directly to the window you specify by name.

Symphony's well-implemented windows make it easy to manage the variety of applications that might be involved in any given project. Like the command menus, the windowing functions might be confusing at first. But after a couple of days of experience, using them to control this powerful system will become second nature.

Inside the Windows

Symphony's various applications windows open onto what is essentially a single large workspace. If you have entered figures in a Sheet window and then open a new window designated for word processing, for example, you'll still see the data you entered in your spreadsheet. To begin entering text, you have to move to a blank area of the underlying worksheet.

This single underlying data structure is the conceptual key to Symphony's entire design, and it offers a number of advantages. First of all, it is the basis of the system's tight integration of applications and the data they contain. Because you're always working with the same extensive data set, any change you make or new data that you enter in one context will be reflected when you switch to another. A given piece of data is in the same worksheet cell no matter what the application, and the windows are something like templates that rename the worksheet cells to suit the application.

Speed of operation is a second big bonus that Symphony's unified data structure yields. Because a change

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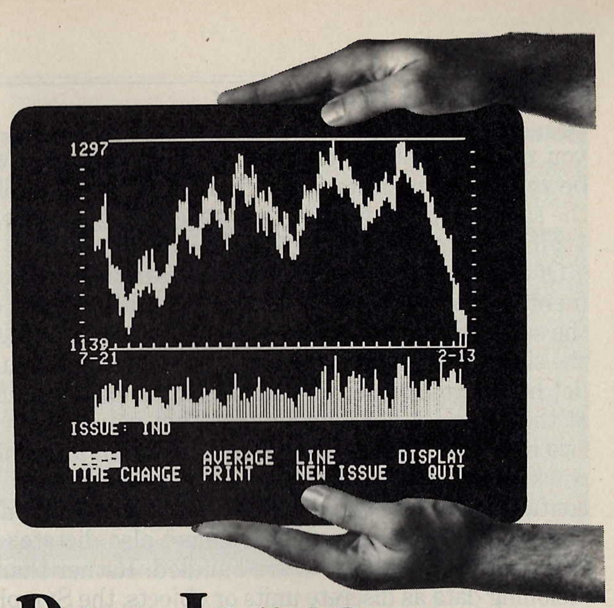

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Circle 29 on inquiry card.

you make to data in one application does not have to be replicated in other parts of a file, Symphony offers the same comparatively blazing speed that has endeared 1-2-3 to so many productivity-conscious users.

Of course, there are some tradeoffs in this design. As mentioned above, the fact that new windows open onto the same worksheet can be somewhat disorienting. Also, the single underlying data structure means that you cannot have two distinct spreadsheets, for example, active at the same time. While it's true that you could create two essentially separate sheets in different areas of the worksheet, this is not quite as neat as having self-contained sheets dedicated to specific applications.

Storing data in a single worksheet also dictates how all data-based operations are handled. Rather than envisioning data as discrete units or objects, the Symphony user would do better to focus on the operation itself. Indeed, this is exactly how you are led to manipulate data in Symphony: you specify the operation first, then indicate the range of data cells to which it applies. As we'll see, the most profound difference between Symphony and Framework stems from the divergent ways the two programs treat the data you enter.

Symphony's Applications

A complete rundown of all the applications features Symphony offers would take us far beyond the scope of this article, but let's look at the five applications one by one to assess their powers on a general level and note especially important capabilities.

Spreadsheet—Lotus's 1-2-3 has become the spreadsheet of choice among personal computer users, and its basic design has not been tampered with in its Symphony incarnation. But there is one significant addition: besides handling numeric calculations and formulas, Symphony's spreadsheet functions can be applied to strings of text characters. This gives you greater control over applications in which numbers and text are combined, such as the generation of reports based on spreadsheet and database records.

Word Processing—Symphony's word processor is a model of simplicity. Rather than attempting to cram every feature of Wordstar into its integrated package, Lotus has rolled almost every word-processing function that would be needed for preparing routine documents into a package that is quite easy to use. Word wrap, automatic reformatting, insert and overstrike modes, global search and replace, easily adjustable format lines that can be named and saved for reuse, and the capability to print headers and footers are all offered. Perhaps the only serious shortcoming is the lack of an Undo command. You'll not find Undo anywhere in Symphony, but it is most sorely missed in word processing. You can always back out of a command that has not been finally issued, but once you hit Return, it's too late for second thoughts.

Graphics—Symphony's graphics capabilities are similar to those found in 1-2-3, except for the addition of high-low-open-close graphs of stock market statistics. As with 1-2-3, a separate Print Graph program must be used to obtain hard copy. While some of the software systems now on the market offer integrated printing of graphs and text, Lotus was unwilling to make the sacrifices in speed of operation that such an implementation would demand. Symphony's graphics software will run on a monochrome system without graphics adapter—you won't be able to preview graphs on your screen, but you will be able to print them. On systems with bit-mapped graphics displays, you can either configure Symphony to display graphs and data or text simultaneously or select toggle mode, which lets you switch between standard displays and graphics displays. Appropriate hardware enables Symphony to display graphs in color.

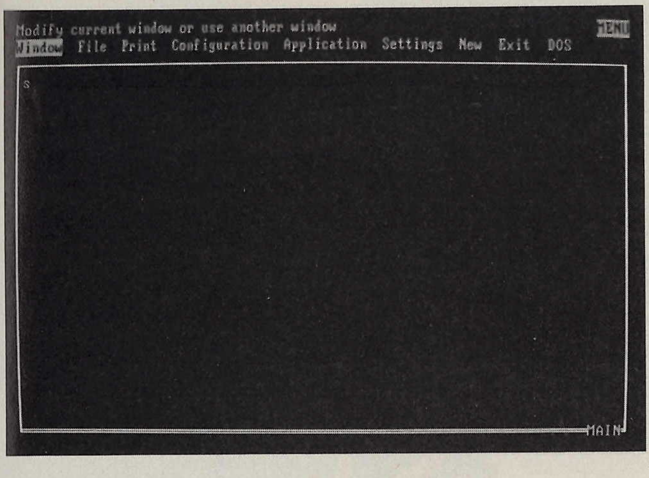
Database Management—Lotus calls Symphony's database forms-oriented, which essentially means that all work in a Form window—whether entering, updating, deleting, or sorting—is done via the form you have set up to organize the fields in each record. Because both the Symphony program and your active data must reside in your computer's internal memory, you don't have much memory available for storing particularly large databases. Thus the most effective use of the database functions is for complex analyses of limited amounts of data or parts of a larger database.

Communications—Symphony's powerful communications capabilities include sending data at baud rates from 110 to 9600, using pulse and Touch-Tone dialing, automatic answering, error checking with the XON/XOFF protocol, echoing of transmissions on your own monitor, switching between voice and data communications, and capturing of incoming files to the worksheet or directly to your printer. All of these functions, together with parity settings, word length, and other parameters, are controlled via setting sheets that you can name and store for later use.

Advanced Capabilities—Symphony includes not only basic macro capabilities but also a powerful programming language of its own. Macros—reusable keystroke or command sequences that can be called up by one or two keystrokes—can be created very easily with the Learn mode, which tells Symphony to remember the keystrokes used in a given operation. Using macros and/or the programming language, an experienced user or consulting programmer can enhance the system's capabilities to suit particular needs in a way that is impossible with most stand-alone applications packages. One could, for example, create a routine that would automatically call a remote database, log on, retrieve specified information, enter it in a spreadsheet, display it graphically, update running averages, and even generate a form-letter report based on the new information.

Other special features of Symphony include a Translate utility that lets you move DIF and dBASE II files into Symphony or translate Symphony files into those formats. As with 1-2-3, you can suspend a Symphony session to access a PC-DOS program. Also, Symphony contains the hooks for what Lotus is calling "add-ins"—tightly integrated enhancements such as spreadsheet templates, spelling checkers, decision-support

OPENING WINDOWS

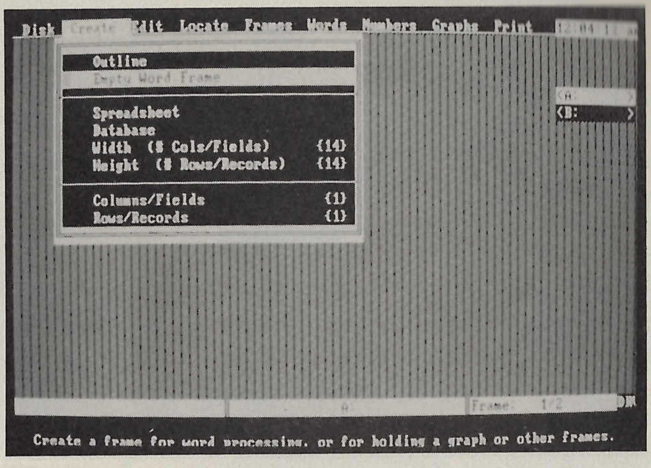


```
Modify current window or use another window
```

MENU
Window File Print Configuration Application Settings New Exit DOS
S
MAIN

SYMPHONY

The Services menu, seen at the top of this screen, lets you create new windows and handle other system-wide functions such as printing and filing.



```
Outline
Empty Word Frame

Spreadsheet
Database
Width  (# Cols/Fields)       {14}
Height  (# Rows/Records)     {14}

Columns/Fields               {1}
Rows/Records                 {1}
```

```
Create a frame for word processing, or for holding a graph or other frames.
```

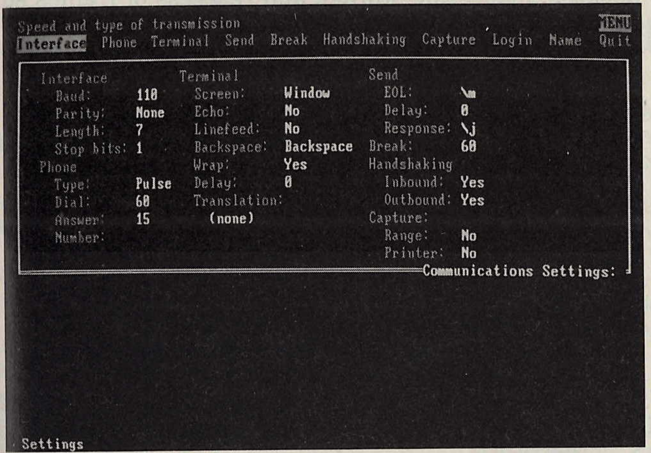
FRAMEWORK

Using the Create menu, you can make new windows and set parameters such as column width. The option you last selected is highlighted as a default choice.

REACHING OUTSIDE

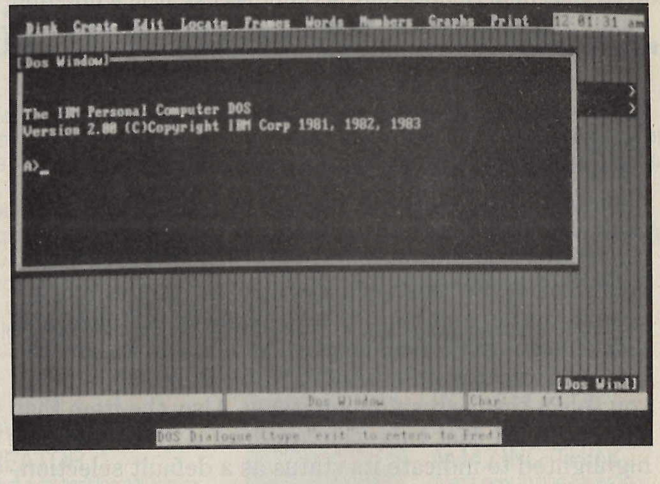
This straightforward Settings sheet lets you specify communications parameters such as baud rate and parity, thus simplifying the process of going on line.

A familiar display in a new setting—the DOS Access frame lets you run standalone MS-DOS programs without leaving the integrated environment.



Speed and type of transmission
MENU
Interface Phone Terminal Send Break Handshaking Capture Login Name Quit
Settings

```
Interface           Terminal                  Send
  Baud:      110      Screen:    Window         EOL:       \m
  Parity:    None     Echo:      No             Delay:     0
  Length:    7        Linefeed:  No             Response:  \j
  Stop bits: 1        Backspace: Backspace    Break:       60
Phone                 Wrap:      Yes          Handshaking
  Type:      Pulse    Delay:     0              Inbound:   Yes
  Dial:      60       Translation:              Outbound:  Yes
  Answer:    15         (none)                Capture:
  Number:                                       Range:     No
                                                Printer:   No
                                          Communications Settings:
```



Disk Create Edit Locate Frames Words Numbers Graphs Print
12:01:31 am
[Dos Window]
[Dos Wind]
Dos Window
Char: 1/1
DOS Dialogue (type 'exit' to return to Fred)

```
The IBM Personal Computer DOS
Version 2.00 (C)Copyright IBM Corp 1981, 1982, 1983

A>_
```

packages, presentation-graphics software, and the like. Such add-ins will be developed by Lotus itself or by closely licensed independent software developers, and some should be available by the end of this year.

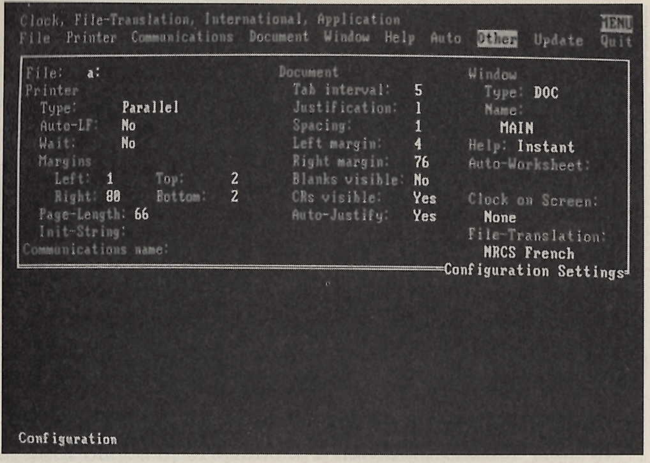
Framework: What's in a Name?

Just as the name Symphony suggests the orchestration of diverse applications, so too has Ashton-Tate chosen a name for its new package that gives some clues to its nature. Whereas Symphony is a system that you work with (or conduct, as it were), Framework is more appropriately described as an environment that you work within.

While it offers many of the same powers as Symphony, Framework has a distinctly different feel. In developing the software's user interface, designer Robert Carr tapped the potential of the much-discussed desktop metaphor without taking the notion too literally.

The name Framework also complements two of the features that set the product apart from Symphony. In addition to spreadsheet, word-processing, database, and graphics functions, a powerful outlining application

SETTING PARAMETERS



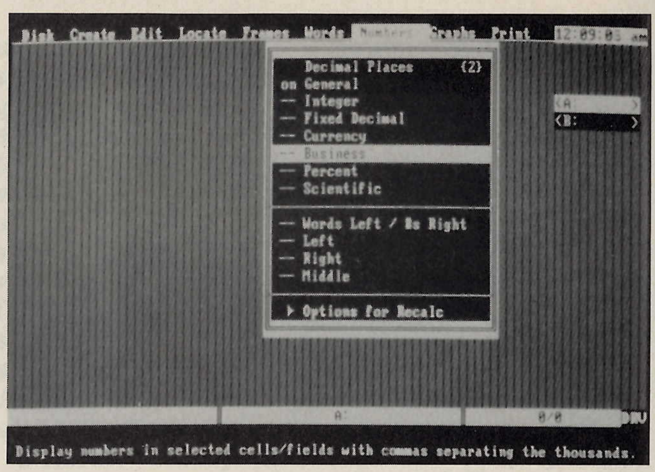
```
Clock, File-Translation, International, Application                     MENU
File  Printer  Communications  Document  Window  Help  Auto  Other  Update  Quit

File:   a:                        Document                  Window
Printer                             Tab interval:    5        Type:  DOC
  Type:        Parallel             Justification:   1        Name:
  Auto-LF:     No                   Spacing:         1          MAIN
  Wait:        No                   Left margin:     4      Help:  Instant
  Margins                           Right margin:    76     Auto-Worksheet:
    Left:   1     Top:      2       Blanks visible:  No
    Right:  80    Bottom:   2       CRs visible:     Yes    Clock on Screen:
  Page-Length:  66                  Auto-Justify:    Yes      None
  Init-String:                                              File-Translation:
Communications name:                                          MRCS French
                                                  Configuration Settings

Configuration
```

SYMPHONY

This Settings sheet puts system configuration parameters for printer type, text formats, and program start-up defaults at the Symphony user's fingertips.



```
Disk  Create  Edit  Locate  Frames  Words  Numbers  Graphs  Print   12:09:05 am

                            Decimal Places      (2)
                        on General
                        — Integer
                        — Fixed Decimal
                        — Currency
                        -- Business
                        — Percent
                        — Scientific

                        — Words Left / #s Right
                        — Left
                        — Right
                        — Middle

                        ▶ Options for Recalc

                                                              <A:       >
                                                              <B:       >

                                  A:                   0/0
Display numbers in selected cells/fields with commas separating the thousands.
```

FRAMEWORK

The ever-present top menu divides applications so that settings for various contexts are handled through submenus like this one for numerical formats.

unique among integrated packages helps you organize the various aspects of any project. Also, a window called DOS Access lets you run any stand-alone PC-DOS program without leaving the Framework environment. But before detailing these, let's start from the top.

When you first start Framework, you see a shaded area that nearly fills your screen. Above it is a one-line menu offering Disk, Create, Edit, Locate, Frames, Words, Numbers, Graphs, and Print—this is your access to all of the system's functions. Selecting any one of these items opens a pull-down menu that overlays the shaded background.

Framework's menu structure is "flatter" than Symphony's in that you rarely have to go beyond two selections. The pull-down menus are more than novelties, for they display significant information in addition to listing your choices. For instance, options that you cannot invoke in the current context are displayed in italics, and default settings for field lengths, column widths, and the like are indicated on the menu and can be adjusted as you select the corresponding items. Also, the item that you chose the last time you accessed a given menu is highlighted to indicate its status as a default selection, giving Framework a degree of self-adaptation to the particular sort of work you typically do.

Like Symphony, Framework permits the so-called power user to indicate menu choices by typing the first letter of the selection. Someone familiar with the available options and quick on the keyboard could enter a complex command in a split second without waiting for the menu to be displayed.

Not surprisingly, Framework's windows are called frames. As is the case with Symphony, they are the means of controlling which of the system's applications is active at any moment. You create each frame, dedicate it to a particular application, give it a unique name, and adjust its size and position on the screen as you desire. You can stack a bunch of frames on the screen and page through them with the + and − keys, but it's neater to store inactive frames on disk. A directory of frame names, always displayed in the lower right corner of the desktop, makes the storage and reaccess of frames so convenient that putting one away even for a few minutes is no bother.

But suppose you're going to be working all day on a long word-processing document and could do without the desktop display. No problem—a single function key will expand your word-processing frame to the point that its borders seem to be just beyond the edges of your screen, leaving you in what by all appearances is a stand-alone word-processing program.

Beneath the Desktop

Rather than giving you different avenues to the same data structure as Symphony's windows do, Framework's frames are discrete units—each contains its own data, and each is stored as a separate disk file. Because one frame can contain another, you'll find that you're working in an environment that has a sense of depth to it.

This approach to integration carries advantages and disadvantages. Because the data entered into and generated by separate applications is stored as discrete units, the automatic linking accomplished by Symphony's single worksheet is not in effect in Framework. Indeed, if you want one frame to reflect changes made in another, you must interlock them overtly by inserting a reference to the second frame in the first. Conversely, though, frames that are interlocked or created within other frames give you an environment that is in certain ways more tightly integrated than Symphony's.

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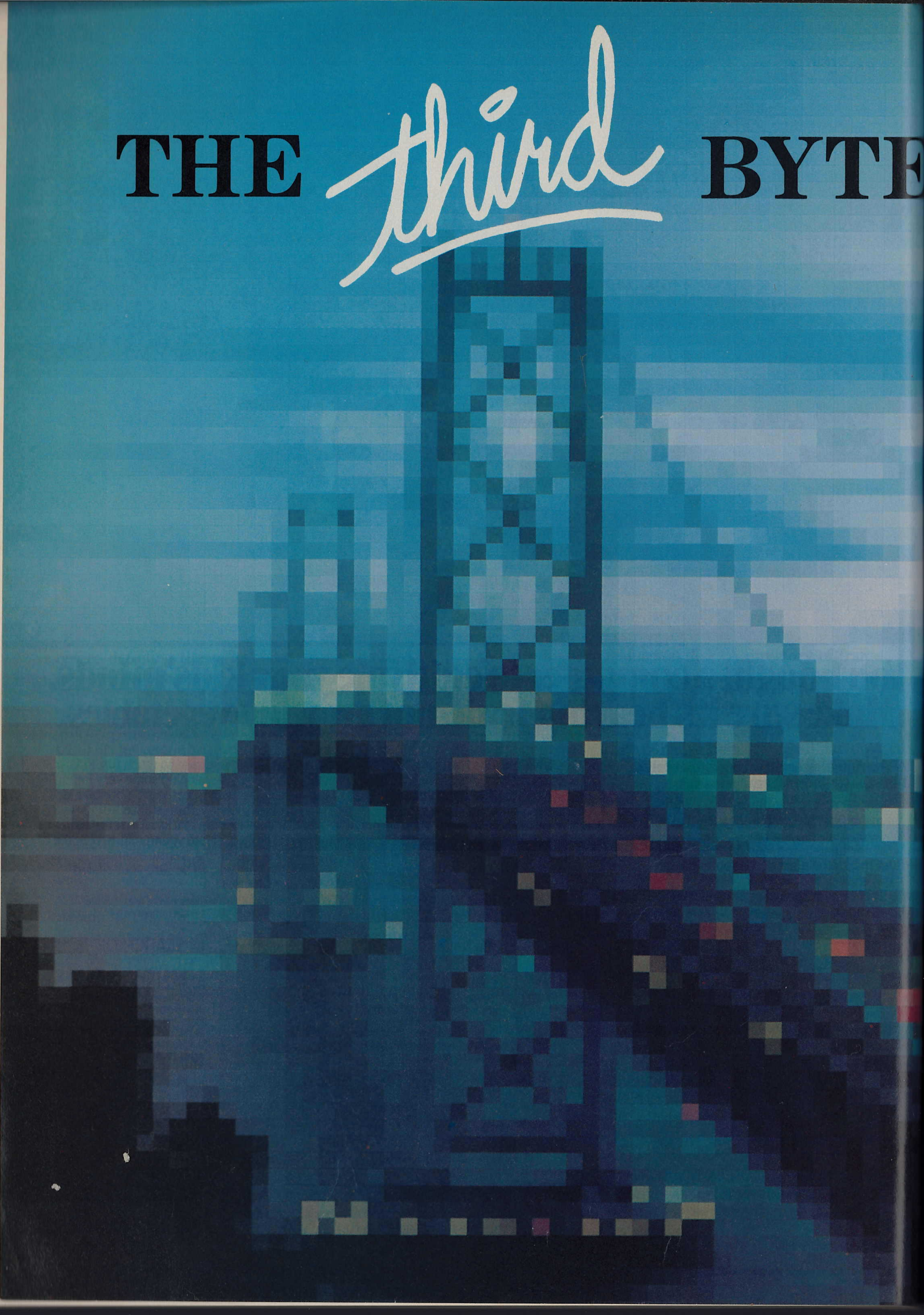

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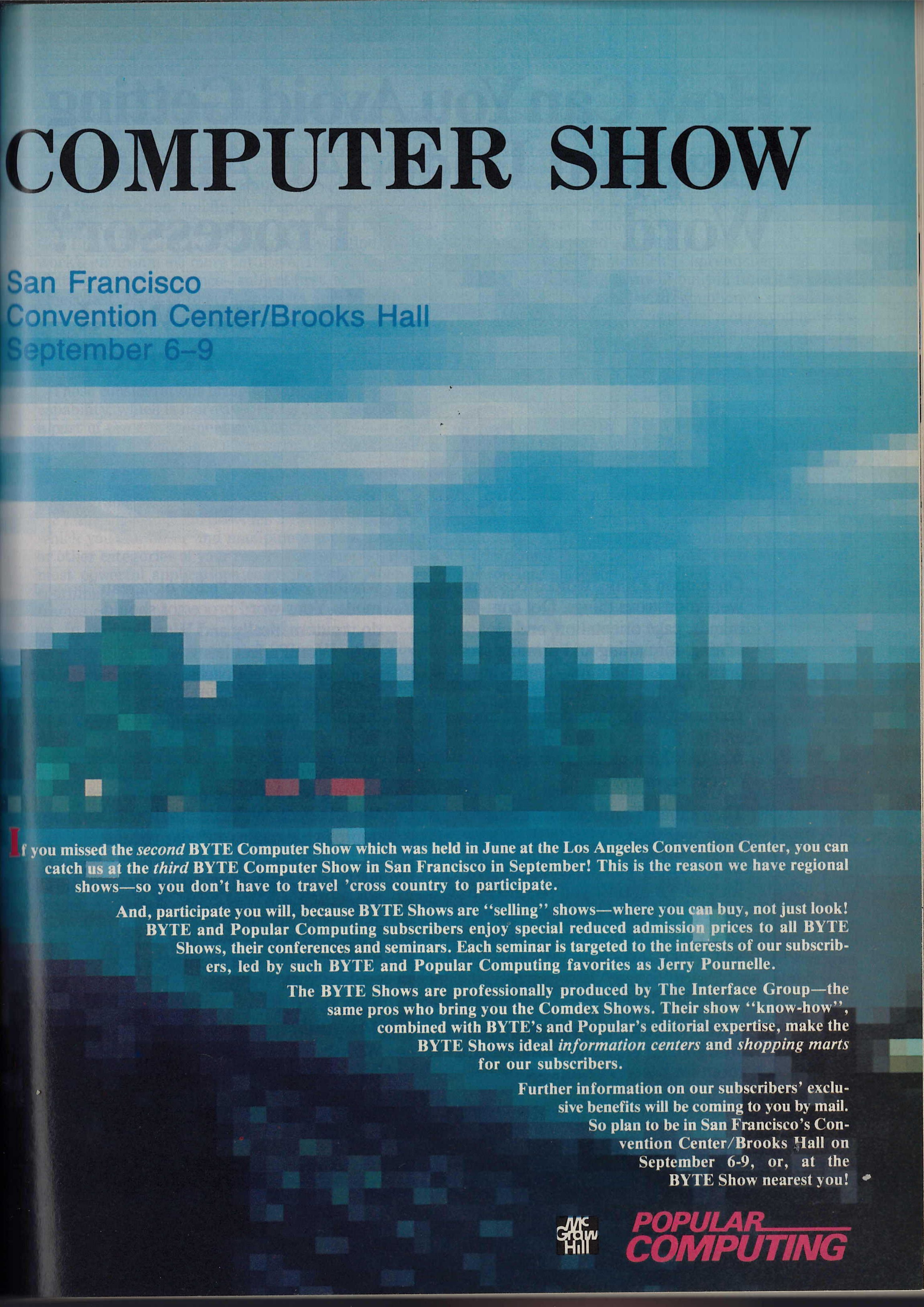

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But the compartmentalization of Framework's data has its most profound effect on the way you manipulate data. The environment is object-oriented in that for any operation, you first specify a data object (spreadsheet cell or range, block of text, database entry, or whatever), then the operation, and finally, if appropriate, the destination (recall that in Symphony you specify the operation first). I predict that many users will find Framework's environment more intuitive. It is analogous to writing a simple sentence—subject first, then verb, and object last. Most of today's linguists and philosophers believe that this object orientation is an accurate model of the way human beings develop any idea, and Framework's emulation of it can only make the program a more natural tool.

These considerations bring up Framework's outlining capability, which is more appropriately treated here as a part of the environment even though it is framed as an application. Calling this powerful feature an outline is something of an understatement, though—you'll be underestimating its potential if you have in mind your eighth-grade history assignments.

Framework's outline provides a flexible structure in which you can enter and manipulate topics, headings, or other categories of your report (for example). But its most powerful applications come into play when you coordinate your outline headings with the names of the frames containing pieces of the report you're working on. In such cases, the Framework outline automatically displays the type of work each frame involves. Thus a quick glance at the outline will reveal which parts of your report contain spreadsheets, graphs, word-processing documents, database analyses, and so on.

Because the outlining feature makes it easy to shuffle the pieces of your report while giving you the opportunity to view its entire structure, it is a tremendous aid in large-scale reorganization of big projects. As long as the frames under each heading are interlocked, you can move extensive blocks of material in one simple, virtually self-evident operation. Also, the outline serves as a preformatted table of contents when it's time to print your report.

Moreover, the outline gives you a thought-provoking model of the best way to use Framework's particular style of integration. For example, using the outline as a model, a middle manager responsible for sales made by a number of representatives could merge their individual spreadsheet-based reports into one comprehensive spreadsheet for bottom-line analysis. Any Framework user is likely to find that working with the system's outlining functions serves as a high-level tutorial in how to implement Framework to its best advantage. Ashton-Tate has enlivened the integrated software scene by introducing this unique player rather than merely recasting the same traditional applications in a new setting.

Traditional Applications

Framework offers full-featured routines for spreadsheet analysis, word processing, database management, and graphics. (At the time of this writing, Ashton-Tate also indicated that communications functions would be integrated into the final product, but they were not a part of the prototype version I looked at.) These traditional applications contain most of the features of stand-alone programs, and indeed, when you're working with one in full-screen mode, it's easy to forget that you're inside an integrated software package.

Spreadsheet—Framework's spreadsheet is very similar to 1-2-3's. Its array of built-in functions puts it on roughly equal footing with Symphony's spreadsheet, and these functions will accept the names you have assigned to rows and columns rather than requiring specific addresses of cells. As for speed, initial tests indicate that Framework's spreadsheet will be in the same league as Symphony's.

Word Processing—Framework gives you on-screen display of attributes like boldface, underlining, and italics, and these can be assigned to text in any application. In a word-processing frame, you can move or copy blocks of text, search for and replace words or phrases, create headers and footers, and center or justify text. Word wrap and dynamic reformatting of text are automatic. Also, the fact that Framework gives you an Undo command (which will work even on itself) puts Ashton-Tate ahead of Lotus when it comes to applications in which words and text take precedence over numbers and spreadsheets.

Graphics—Framework lets you create graphics directly from the spreadsheet and display them simultaneously with text on the same monochrome display (additional graphics hardware will enable you to get higher resolution and color displays). Unlike Symphony, the program is able to print text and graphics together. Line, bar, stacked bar, and pie charts are offered, and when created from a spreadsheet that has labeled rows and columns, the labels are automatically displayed on the graphs. Although Symphony's graphics offer some more advanced features, Framework's ability to display and print graphs together with text makes its graphics a more fully integrated application.

Database—Framework's database functions are easy to use and quite powerful, but as with Symphony, the fact that the program is memory based limits database size. This integrated application will not challenge Ashton-Tate's dBASE II or even Friday, and as if to underscore this, Framework can search and sort (but not update) files created with those stand-alone programs.

Advanced Applications

Besides its unique outlining feature and the traditional applications just described, Framework also offers two more advanced features: a DOS Access frame and a sophisticated programming language called Fred.

As a facility for obtaining more specialized applications, Framework's DOS Access frame represents an approach quite different from Symphony's "add-in" potential. While Lotus will equip Symphony with an assortment of tightly integrated enhancements, Ashton-Tate

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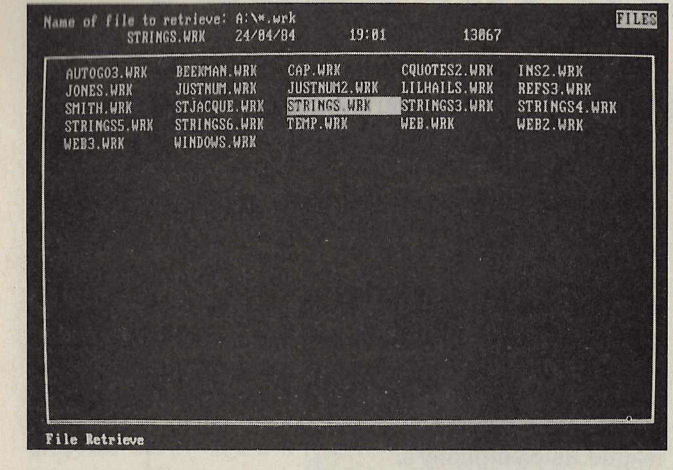


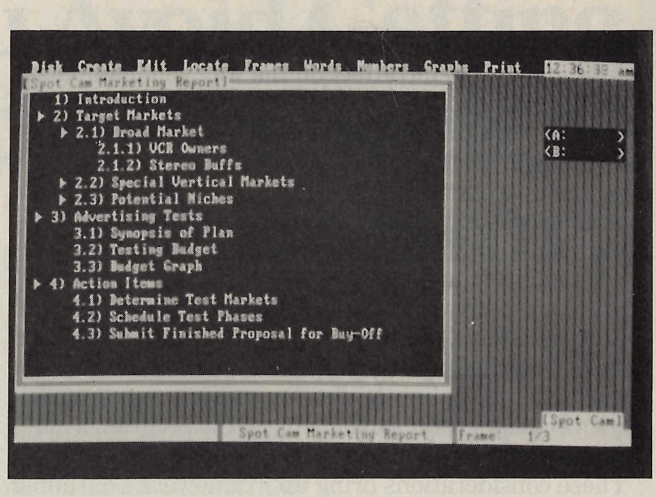
```
Name of file to retrieve: A:\*.wrk                                   FILES
           STRINGS.WRK    24/04/84       19:01          13067

  AUTOGO3.WRK   BEEKMAN.WRK   CAP.WRK       CQUOTES2.WRK  INS2.WRK
  JONES.WRK     JUSTNUM.WRK   JUSTNUM2.WRK  LILHAILS.WRK  REFS3.WRK
  SMITH.WRK     STJACQUE.WRK  STRINGS.WRK   STRINGS3.WRK  STRINGS4.WRK
  STRINGS5.WRK  STRINGS6.WRK  TEMP.WRK      WEB.WRK       WEB2.WRK
  WEB3.WRK      WINDOWS.WRK

File Retrieve
```

SYMPHONY

Issuing the File Retrieve command gives you this display, which lists all file names and shows the size and date of last update for highlighted file name.



Disk Create Edit Locate Frames Words Numbers Graphs Print
12:36:39 am
<A:
<B:
[Spot Cam]
Spot Cam Marketing Report
Frame: 1/3

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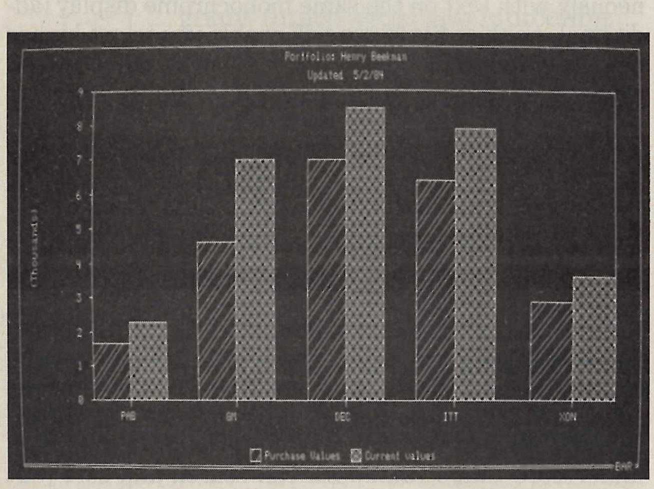
[Spot Cam Marketing Report]
   1) Introduction
 ▶ 2) Target Markets
    ▶ 2.1) Broad Market
          2.1.1) VCR Owners
          2.1.2) Stereo Buffs
    ▶ 2.2) Special Vertical Markets
    ▶ 2.3) Potential Niches
 ▶ 3) Advertising Tests
      3.1) Synopsis of Plan
      3.2) Testing Budget
      3.3) Budget Graph
 ▶ 4) Action Items
      4.1) Determine Test Markets
      4.2) Schedule Test Phases
      4.3) Submit Finished Proposal for Buy-Off
```

FRAMEWORK

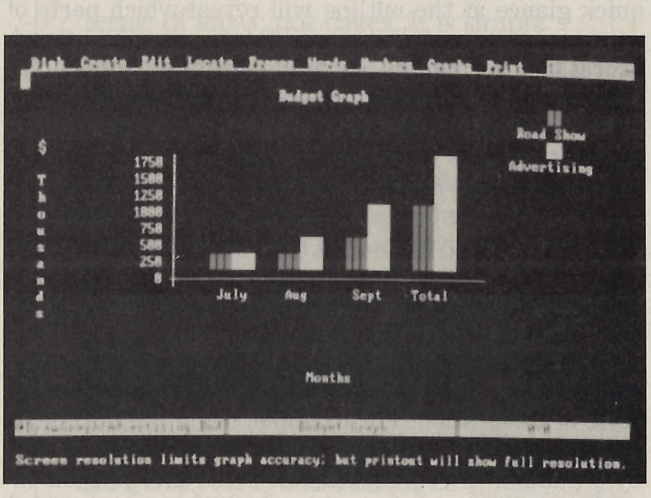
The integrated outlining function, Framework's most novel aspect, should be invaluable to those whose work involves large-scale reorganization of documents.

DISPLAYING GRAPHICS

In its most basic configuration, the system lets you toggle between displays of text or data and full-screen graphics displays like this bar chart.



While you can display graphs and text on the same screen, you can instantly get this sort of full-screen display of any frame at the touch of a function key.



Screen resolution limits graph accuracy: but printout will show full resolution.

has sacrificed absolute integration to let you use stand-alone PC-DOS applications programs without leaving the Framework environment. Given a computer with enough memory, you can even run powerful programs like 1-2-3 in the DOS Access frame.

You cannot fully incorporate an external application into Framework, however. There is no easy way to link an outside application so that recalculation would become automatic, but you can integrate text files produced by the program you run in the DOS Access frame. For instance, you could overcome Framework's lack of communications software by running a stand-alone communications program in the DOS Access frame and then incorporating text files of incoming data into any Framework routine or application.

Framework's macro capability and advanced programming language offer great potential for developing custom functions and routines. Because you store Framework macros either in frames of their own or in a special library frame that is automatically searched by the system, custom formulas that might apply to more than one set of data do not have to be copied to

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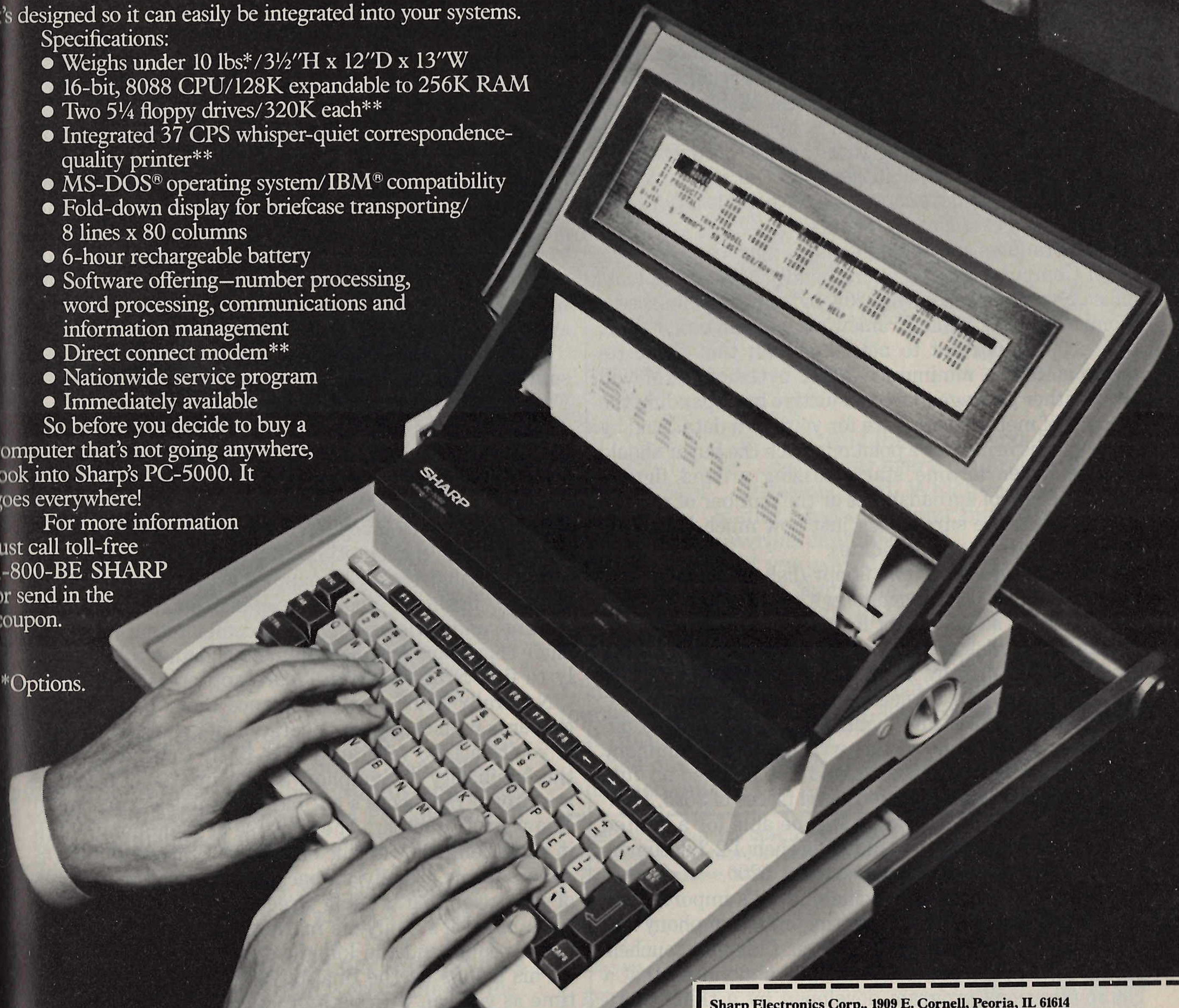

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new locations before they will process additional data. A custom function that you develop to execute a process commonly encountered in your own particular line of work can be stored in the library frame and then called into play just as if it were a built-in function.

Fred, Framework's integral programming language, offers 140 verbs that give you the power to develop functions and routines tailored to your particular needs. Indeed, Ashton-Tate claims that a full-scale accounting package could be developed with Fred in less than one-third the time it would take to build it from scratch. Just as Symphony's programming language does for Lotus's product, Fred makes Framework a software tool open to virtually unlimited customization.

So What's the Difference?

By now you're probably suffering from the feature-shock that's a common symptom of first encounters with these two remarkably powerful pieces of software. How can you ever figure out which is better suited to the work you do? Recognizing that the two products offer many of the same capabilities and thus answer many of the same needs, let's contrast their notable differences to help you get a clearer picture.

Both products are being introduced for the IBM Personal Computer and its operationally compatible look-alikes. Symphony requires 320K bytes of random-access memory (RAM), while Framework will run under 256K bytes. It's important to note, however, that these requirements are minimums—512K bytes of RAM will make either package more productive by expanding the amount of memory you have for your own data. And by the way, this brings up a point on which the buyer should beware: when anyone starts tossing around figures about the size of spreadsheets or the number of records in a database, be sure to ask just how much RAM you need to attain those capacities.

Framework requires two floppy-disk drives, but Symphony will run on a machine with only one. This difference is not so important for the office user, who will want a pair of disk drives for either program, but it does mean that Symphony has greater potential for future implementation on a kneetop portable computer.

Regarding prices and availability, there are no differences. At the time of this writing, both Symphony and Framework were scheduled to be shipped on July 2, and both carried suggested retail prices of $695. However, registered 1-2-3 owners will be able for a limited time to get Symphony by trading in their 1-2-3 documentation and system disks and paying $200.

Speaking of prices and availability, it's important to note that at the time of this writing both Symphony and Framework were still getting their finishing touches. Rather late in the game Ashton-Tate announced that a communications program developed by a third party would be fully integrated into the Framework environment by the time the product is officially released. Such a move is clearly to counter Lotus, and in turn it would be no surprise if one of the first Symphony add-ins were an outlining function. And this sort of competition will not end with the release of the first versions of the two products. As noted earlier, both packages will occasion a host of enhancements. Moreover, both companies are already at work on more powerful versions of today's products. Indeed, at the recent Comdex in Atlanta, Lotus showed parts of what is going under the working title of Symphony Plus, an expanded, even more capable package for the soon-to-be-released 512K-byte Apple Macintosh. According to Mitch Kapor, this mouse-controlled integrated program will be released in mid-first quarter of 1985.

As I've suggested all along, the biggest difference between the two products is the way they handle your data vis-à-vis the operations you apply to it. The advantages of Symphony's single underlying data structure are clear—tight integration, optimum speed of operation, easy data manipulation, and the capacity for large files. For complex, quantified analysis of data, Symphony will be hard to beat.

Framework's structure is more hierarchical, and as such it is more suited to organizational tasks. If we say that Symphony's particular advantages can be represented as growing from its embodiment of the spreadsheet model as a universal data structure, then we'd represent Framework's different feel and particular advantages as contingent on the outline model, which in fact does seem to be the underlying concept of the system.

What it all boils down to is that Symphony is better suited to working with numbers and formulas while Framework is more adept at handling words and ideas. There are some fallacies in this tidy statement—after all, formulas are born as ideas, Symphony does give you a capable word processor, and Framework contains a powerful spreadsheet. But it is nonetheless true that those whose work involves complex analyses of numerical data and the creation of reports based on such analyses will probably be happier with Symphony. Conversely, business people responsible for planning, writing, and revising lengthy documents that might include charts and graphs of numerical data would be likely to find Framework the more appropriate tool.

Naturally you'll want to balance these fundamental concerns with careful consideration of important details. If you're a 1-2-3 veteran, you're likely to be swayed by the familiarity of Symphony's user interface; if you're a writer, Framework's outline will impress you. You'll also want to compare the promise of Symphony's add-in enhancements with the benefits of Framework's DOS Access frame. Finally, sit back and bask in the barrage of promotion that is being directed at the business software user—it's a buyer's market, and you're in a position to command the kid-glove treatment.

This brings up the final buyer's tip: spend as much time as you can with both products before you make a decision. All the feature wars amount to nothing compared with how the software's organization and style fit the way you work. Because it is on this level that Symphony and Framework differ most markedly, it is the most crucial aspect of your decision. □

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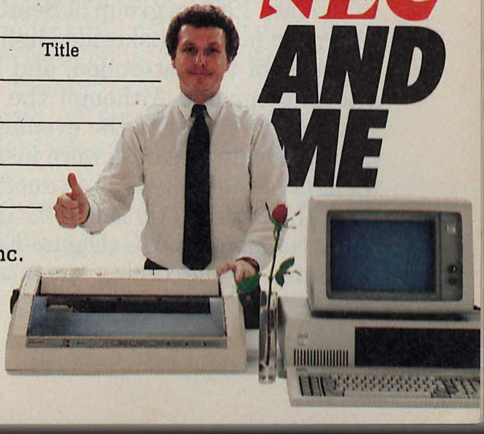

WORLD Magazine, July 1983

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The Making of the Personal Computer

FIRE in the Valley

PART ONE

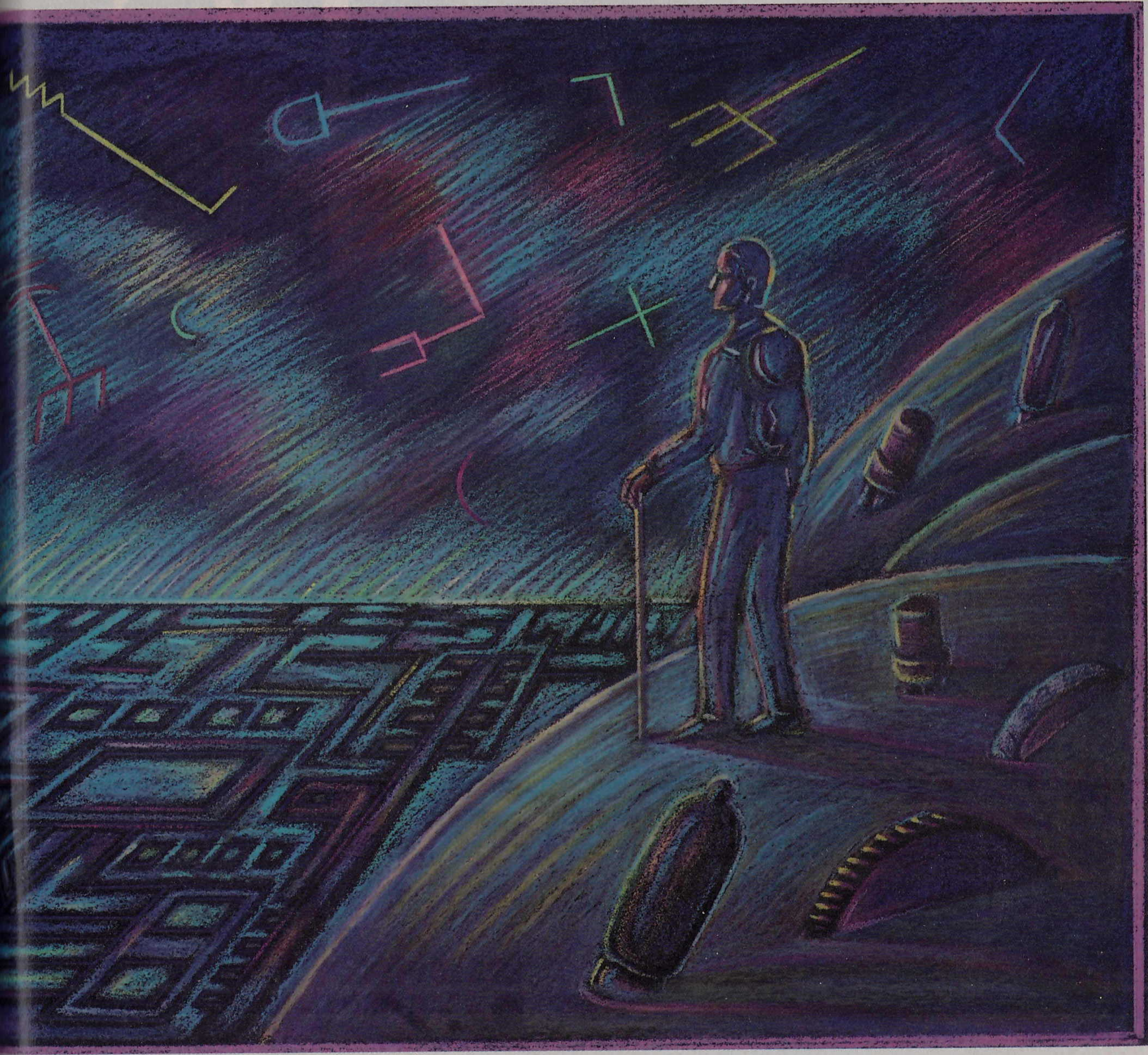
by Paul Freiberger and Michael Swaine

In the late 1960s a group of Seattle teenagers met each afternoon outside Lakeside High, the private suburban high school they attended, and biked to the offices of a local company. Although the company's employees were going home for the evening and the firm was officially closing, the boys were just getting started. They thought of themselves as an unofficial night shift. Every night they worked till long after dark, pounding the keys of the company's DEC (Digital Equipment Corporation) computer, while dining on pizza and soft drinks.

The leaders of the group were an unusual pair. More than any of the others, they were fascinated by computers; in fact, this fascination had earned them the label "computer nuts" among their classmates. Paul Allen, a soft-spoken 15-year-old, would have paid for the chance to work on the machines. His friend Bill Gates, 13 years old and looking even younger, was proud of his abilities in mathematics and was hooked on programming.

Gates, Allen, and the others had been hired—"allowed" might be a better word, since they worked for the fun of it, without pay—to find errors in the computer's programming. Computer Center Corporation (the boys

Illustration by Anthony Russo



called it C Cubed) was happy to have them around. According to the terms of C Cubed's contract with DEC, as long as C Cubed could show DEC that DEC's programs had bugs (errors that caused the programs to malfunction or "crash"), C Cubed didn't have to pay DEC for using the computer. The kids were postponing the day when C Cubed had to pay its bill to DEC.

The DEC programs were new and complex, and there was nothing surprising in the fact that they were not entirely error-free. DEC's arrangement with C Cubed was a common technique for tracking down the subtlest bugs in such complex programs, and the kids found plenty of bugs in the next six months, with young Bill Gates finding more than his share. The *Problem Report Book*, as the boys labeled the journal of their discoveries, grew to 300 pages. Finally DEC called a halt, telling C Cubed, as Gates later recalled it, "Look, these guys are going to find bugs forever."

Allen and Gates stayed on for some months at C Cubed after the other boys left and eventually drew pay

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for their work. The computer they worked on was a marvel of modern engineering. DEC had pioneered the concept of the minicomputer, which changed the computer from a wall of circuitry affordable by only the federal government and the largest companies into a box the size of a refrigerator, a machine that medium-sized offices, factories, and academic departments could afford. But the minicomputer was just a step on the path of miniaturization that would lead to the personal computer. Allen and Gates, loving their work at C Cubed, found themselves dreaming of the day when they would own their own computers. "It's going to happen," Paul Allen used to tell his friend.

It happened. Today the personal computer is an established consumer product sold like a stereo system. Its sleek plastic case may be slender enough to slip into a briefcase. Flashy graphics and joysticks make it a programmable personal video game arcade. Its information storage is encyclopedic, its capabilities protean. The personal computer—or microcomputer—can act as a typewriter, calculator, accounting system, financial spreadsheet, telecommunications instrument, library, paint and easel, tutor, and toy. Personal computers, nonexistent as recently as 1974, are now in use in the office, in the home, in the laboratory, in the school, on airplanes, and at the beach. Retail outlets for these universal machines have in a few years become as common as camera shops. Almost overnight, a revolution has taken place: what was once a fearsome "electronic brain" tended by a white-coated computer priesthood is now a consumer product.

The personal computer field is now almost synonymous with "high tech," yet the machines did not develop in the well-equipped, antiseptic labs that phrase calls to mind. The personal computer and the personal computer industry were created by hobbyists such as Gates and Allen, working after hours in garages, warehouses, basements, and bedrooms. These "computer nuts" fired the personal computer revolution out of their own fascination with the technology. Their story is as unusual as any in modern business. It is the story of overnight millionaires bewildered by their success, populist engineers soldering in their garages machines that would change our lives, manufacturers afflicted with a spirit of fierce consumerism, consumers who accepted faulty merchandise for the fun of fixing it themselves, and a spirit of sharing of hard-won technical information—a spirit rare in any industry, but essential for the proliferation of the personal computer.

The fire of the personal computer revolution broke out in many places in the mid-1970s, but nowhere did the fire spread as it did in Silicon Valley, the center of high-tech development in California. This is the history of that revolution in the Valley and elsewhere.

TINDER FOR THE FIRE

I wish to God these calculations had been executed by steam.
Charles Babbage

Steam

THE personal computer sprang up in the mid-1970s, but its roots run deeper, beyond the giant electronic brains of the 1950s, to the "thinking" machines of 19th century fiction.

Could a machine actually think? This was a tantalizing and frightening question for the intellectuals of the 19th century. Two famous observers of the changes being wrought by science, Lord Byron and Percy Bysshe Shelley, sat out one rainy summer in Switzerland discussing artificial life and artificial thought, pondering whether "the component parts of a creature might be manufactured, brought together, and endued with vital warmth." Mary Wollstonecraft Shelley, a party to the discussions, mentally took notes of the conversation and expanded the theme of artificial life in her novel *Frankenstein.* Mary Shelley's book was a genuinely frightening allegory to readers in the age of steam.

The early part of the 19th century was an age of mechanization, and the symbol of mechanical power was the steam engine. The steam engine had first been put on wheels in that century, and in 1825 the first railway was opened for public use. Steam was the symbol of power and represented the mystique that electricity and atomic power would have for later generations. When in 1833 mathematician, astronomer, and inventor Charles Babbage worked out the first design for a steam-driven machine that he claimed would mechanize thought, many people looked upon him as a real-life Victor Frankenstein.

Although the limited precision of machine tools of that time prevented him from carrying out his design, Babbage was no idle dreamer; he worked on his Analytical Engine, drawing on the ideas of mathematicians like George Boole until his death in 1871. Babbage intended that the machine free people from the more boring aspects of thinking, just as some of the new machines of that era were freeing people from some types of physical drudgery.

Babbage had a colleague, patroness, and scientific chronicler, Augusta Ada Byron, daughter of Lord Byron, pupil of algebraist Augustus De Morgan, and later Countess Lovelace. A writer herself and a fine mathematician, she thought it wise to reassure people that the Analytical Engine did not think for itself but could

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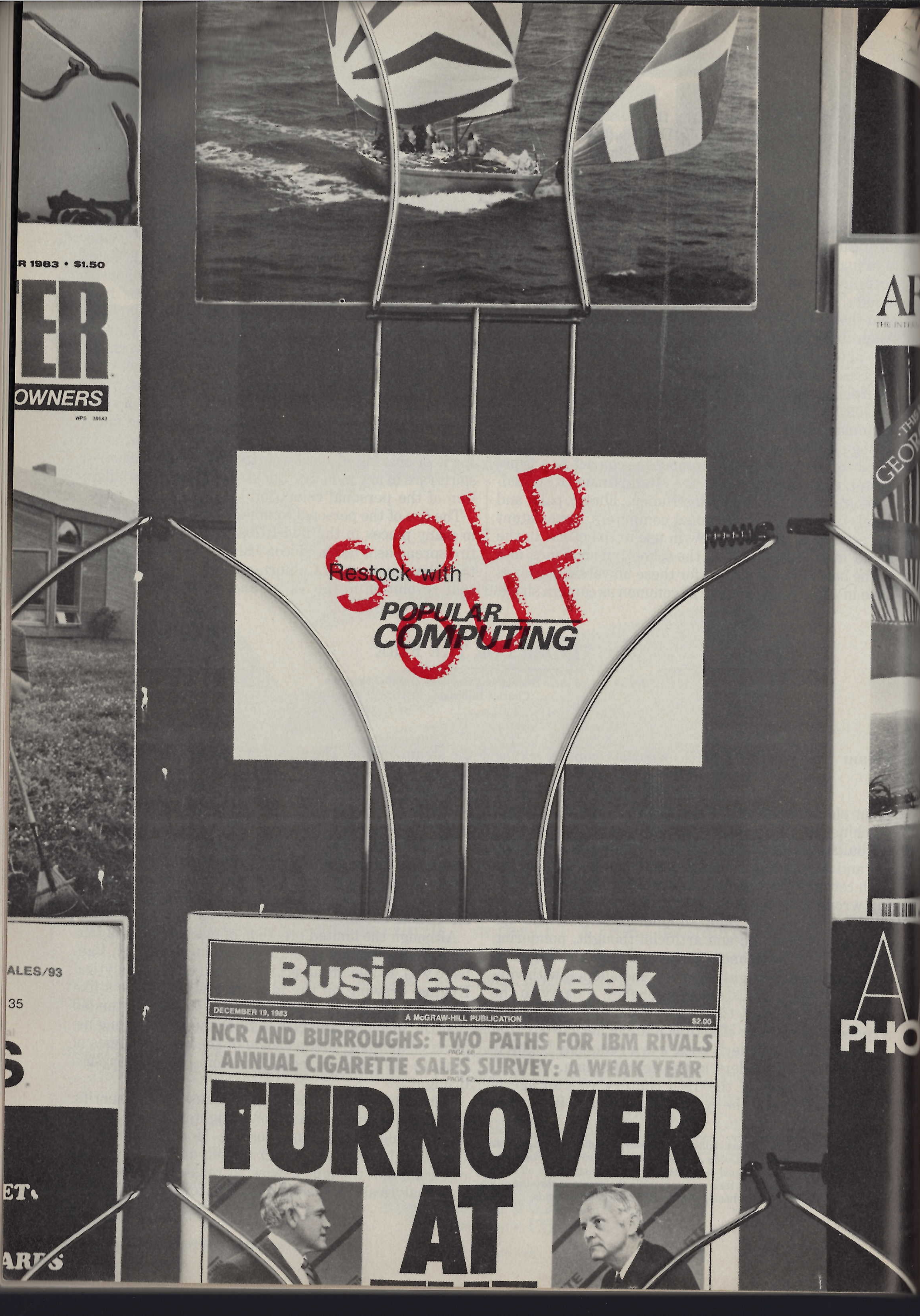
Paul Freiberger, a West Coast editor of *Popular Computing*, and Michael Swaine, editor in chief of *Dr. Dobb's Journal*, spent over two years researching the development of the personal computer and interviewing almost all of the industry's pioneers to obtain their accounts while the events of this dramatic chapter in the history of technology were still fresh in their minds.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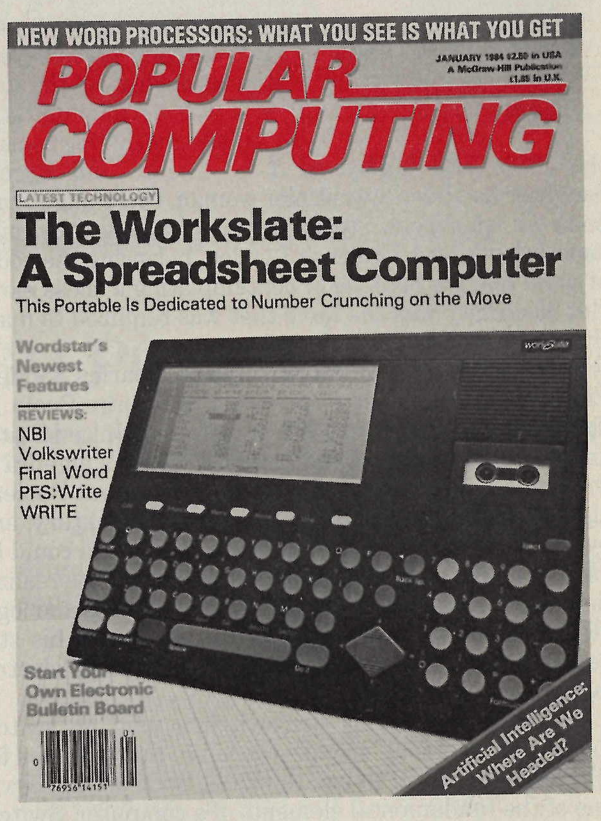

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do only "what people knew how to order it to perform." What Ada Lovelace did not say, because she did not know it, was that the Analytical Engine was very close to being a true computer in the modern sense of the word. What people knew how to order it to perform was to be accomplished by means of coded instructions that would today be called software.

The Analytical Engine Babbage planned was to be a huge, loud, outrageously expensive machine, capable of storing 1000 numbers of 50 decimal digits each. Today this would be spoken of in terms of the *memory size* of the machine (memory is the word for a computer's internal storage). The Analytical Engine had a larger memory than the first true computers and early microcomputers of the 1970s had. It was to be capable of one addition operation—not logical operation—per second. The Engine was to be powered by steam. But neither the money to build the machine nor for that matter the precise technology to make the fine gears the Engine would require in large numbers was available. The machine, brilliantly and minutely designed over many years of Babbage's life, was beyond the technology of the time and was never built.

> IN 1944 THE MARK 1 WAS HAILED AS THE ELECTRONIC BRAIN OF SCIENCE FICTION FAME

If the machining tools of the 1830s had possessed more finesse and Byron's daughter had been a wealthier woman, there might have been an enormous steam engine computer belching logical clouds over Dickens's London, balancing the books of some real-life Scrooge or contemplating a chess move. But electricity was the force that was required to make the machine Babbage wanted.

In the 1860s, the American logician Charles Sanders Pierce began lecturing on the work of George Boole. In doing so he brought symbolic logic to the United States and radically modified and extended Boole's algebra in the process. Pierce probably knew more about Boolean algebra than anyone else in the mid-19th century, and by the 1880s he realized that Boolean algebra could be used to model electrical switching circuits. This realization meant that electrical calculating machines and logic machines could, in principle, be built. One of his students, Allan Marquand, actually designed an electric logic machine in 1885.

The "switching circuit" (or "switching unit" or "switching organ" or "relay organ"—there are many names for it) Pierce proposed to use to model Boolean algebra is one of the fundamental elements of a computer. Switching organs can appear in a wide variety of technological guises, including electrical circuits, but their logical function remains the same. Corresponding in some ways to the neuron in the brain, a switching unit is any device that responds to a specified stimulus or set of stimuli with an energetically independent response. The energy of the response—whether electrical, mechanical, or chemical—is not supplied by the stimulus but by an independent source. The stimulus merely directs the energy of the response, much like a valve or a switchman at a railway siding.

The substitution of electrical circuitry for mechanical parts allowed, among other benefits, a reduction in computer size. In fact, the first electric logic machine ever constructed was a portable device designed and built by Benjamin Burack to be carried in a briefcase. Burack's logic machine, built in 1936, was constructed to test the elementary deductive schemata called syllogisms. "All men are mortal," and "Socrates is a man," Burack could code into the machine. The logic machine would accept the conclusion, "Socrates is mortal." Improper deductions ("All men are Socrates," "Socrates is a woman") closed circuits and caused labeled lights to glow indicating the kind of logical error committed.

Burack's device was certainly a limited-purpose machine with limited capabilities. But practical special-purpose devices primarily dealt with numbers, not logic. Much earlier, Hermann Hollerith had designed a tabulating machine used effectively in the census of 1890. Hollerith's company was later absorbed by what came to be called the International Business Machines Corporation, and IBM was, by the late 1920s, making money putting special-purpose calculating machines in businesses and thereby automating routine numerical thought.

Spurred by Claude Shannon's PhD thesis at MIT explaining how electrical switching circuits could be used to model Boolean logic, IBM executives in the 1930s agreed to finance a large computing machine based on electromechanical relays. Although they later were to regret it, IBM executives gave Howard Aiken, a Harvard professor, $500,000 to develop Mark 1, a calculating device much in the spirit of Babbage's Analytical Engine.

Babbage, though, had designed a purely mechanical machine. Numbers were to be stored in registers formed of toothed wheels, and carrying in addition was done via cams and ratchets. The Mark 1 was an electromechanical machine with electric relays serving as the switching units and with numbers stored in banks of these relays. Calculation was a noisy affair; the electrical relays clacked open and shut incessantly. When the Mark 1 was completed in 1944, it was widely hailed as the electronic brain of science fiction fame. But IBM executives wailed when, as they saw it, Aiken failed to acknowledge IBM's contribution at the unveiling. And IBM had other reasons to regret its investment. Even before work began on the Mark 1, technological developments elsewhere had made it obsolete.

Electricity was making way for electronics. As others had earlier put electrical relays in the place of Babbage's steam-driven wheels and cogs, John Atanasoff, a pro-

CONTINUED ON PAGE 192

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The Commodore SX-64

The portable version of the Commodore 64 has finally arrived

by Kenneth Wildman

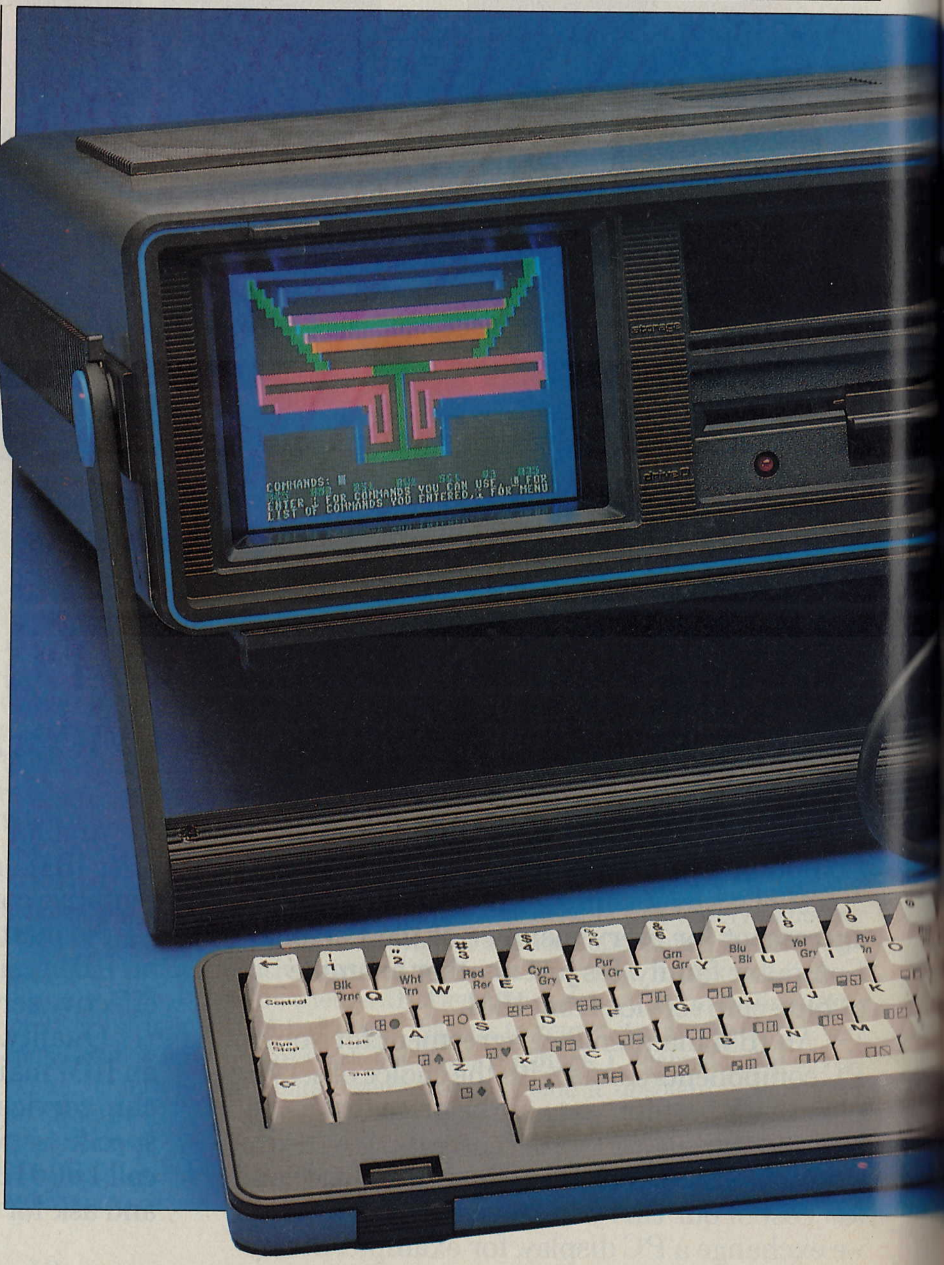
Way back at the Consumer Electronics Show in January 1983, Commodore announced a portable version of the Commodore 64. It promised a color monitor, disk drive, and portability in an attractive package. For a year we waited for this computer, each day thinking that perhaps we had only viewed a mirage, a promise that would never be kept.

Yet miracles still happen. My machine arrived intact and functioned perfectly despite the fact that it had traveled over a thousand miles without the protective card inserted in the disk drive.

The SX-64 is a repackaged Commodore 64, including the computer, detachable keyboard, a half-height drive, and a color monitor in a single integrated unit. Inside the unit, you won't find any changes; the 6510 microprocessor combined with the 6567 video chip and the 6581 sound chip provides total compatibility with all Commodore 64 software. To make a portable machine, the engineers took on new design tasks. Some of the solutions make vast improvements in the capabilities of the 64, and the others. . .well, you might wonder who did the thinking.

Overexposed Components

When I set up the machine, I noticed the uncovered opening for the keyboard cable connection. When you remove the keyboard cable, you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Photograph by Paul Avis

AT A GLANCE: SX-64 Portable Color Computer (Executive 64)

Manufacturer:	Commodore Business Machines, West Chester, PA 19380, (215) 431-9100
Standard Features:	6510 microprocessor; 64K bytes of RAM; one-piece design, 27.6 pounds, 5 inches high by 14½ inches wide by 14½ inches deep; detachable 66-key keyboard with 4 function keys; 5-inch (diagonally measured) color monitor with 25 lines by 40 characters and resolution of 320 by 200 pixels; eight independently programmable "sprites"; 3-channel music/voice synthesizer; single 5¼-inch disk drive; ROM cartridge port; 2 game ports; serial port; modem or RS-232C port; and audio-video port
Documentation:	174-page manual
Options:	All peripherals for Commodore 64 including Z80A CP/M cartridge or disk, direct-connect modem, auxiliary model 1541 disk drive, 13-inch color monitor, MPS801 dot-matrix printer, model 1520 printer/plotter
Price:	Commodore has not announced recommended list prices; advertisements and local quotations suggest availability in the range of $860 to $950

can see the black-and-white bars for checking the speed of the drive on the bottom of the disk drive. I'm sure many service technicians will welcome this convenient access, but the opening also provides a handy entrance for dirt and dust—hardly the type of material you want cluttering your disk.

The unit's top surface has a spring-loaded door covering the ROM cartridge port. On the back, you'll discover the remaining connectors and ports. While this appears to be a logical location for the two joystick ports, the serial port, the audio-video port, the edge connector card, the power input and the power switch, the back becomes the bottom when you carry the machine. Even the strongest computer user cannot carry a 25-pound machine without occasionally setting it down to rest. But if you do this, you're exposing these ports and switches to a variety of elements—dirt, water, carpet fuzz. In fact, the exposed openings on three sides demand the use of a protective cover if you value your investment. According to Commodore, it has no plans to make such an item available.

My initial impression of the keyboard—which has a light touch conducive to fast typing—convinced me that ergonomic engineering was at work. Then I attempted to read what I had typed on the display. So much for ergonomics. Given the investment that a company makes to

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Kenneth Wildman is an educational computing consultant who lives in Ada, Ohio.

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bring a new model to market, it is surprising and disappointing that no one at Commodore seemed to consider redefining keyboard characters in ROM. Legibility is step one in ergonomic engineering textbooks and even the simplest research reveals that visibility problems occur when you reduce a screen display to 5 inches.

Fuzzy Numbers

Eventually I resorted to a magnifying glass whenever I needed to work on a spreadsheet. It proved to be the only tool capable of helping me determine the differences between 8, 9, and 0. The perceptual effects occurring from image reduction happen, first, because the picture element or pixel density per unit of area increases. The SX-64 resolution is 320 by 200, or 64,000 pixels crammed into a 5-inch-diagonal, or actually, a 4-inch by 3.25-inch screen. Densely packed pixels work well with straight edges by smoothing lines and increasing the definition. But the size reduction makes complex details more difficult to discern. Particularly, rounded edges become difficult to discriminate. What was needed was a different character font. After all, a computer characterized as an "executive model" must provide a display that lets you run typical business applications.

A simple and relatively inexpensive solution would be to reprogram the area of ROM containing the shape patterns for the 8, 9, and 0. But without a completely legible character set the SX-64 can't be used satisfactorily for applications requiring a numeric display.

So how about the text display? After using three different word-processing programs and playing three text-based adventures, I must conclude that it's possible to read the material on the screen, but not for very long. I got the best results when I used the monitor controls to remove the color, giving me reasonably legible dark characters on a light background.

Arcade games make the SX-64 shine. The color, animation, and sound deliver a superb game-playing experience. Those tightly packed pixels that ruin the numeric display produce wonderfully sharp lines and edges to arcade images.

Commodore tries to deliver a strong machine for the dollar. The SX-64 comes close. For less than $1000, it offers portability, excellent arcade graphics, a single disk drive, a strong recreational software base, adequate applications software, and an excellent keyboard. But the confusing numeric display, inadequate for serious applications, and lack of attention to other important details makes me wonder how much interest Commodore really has in the success of this product. ☐

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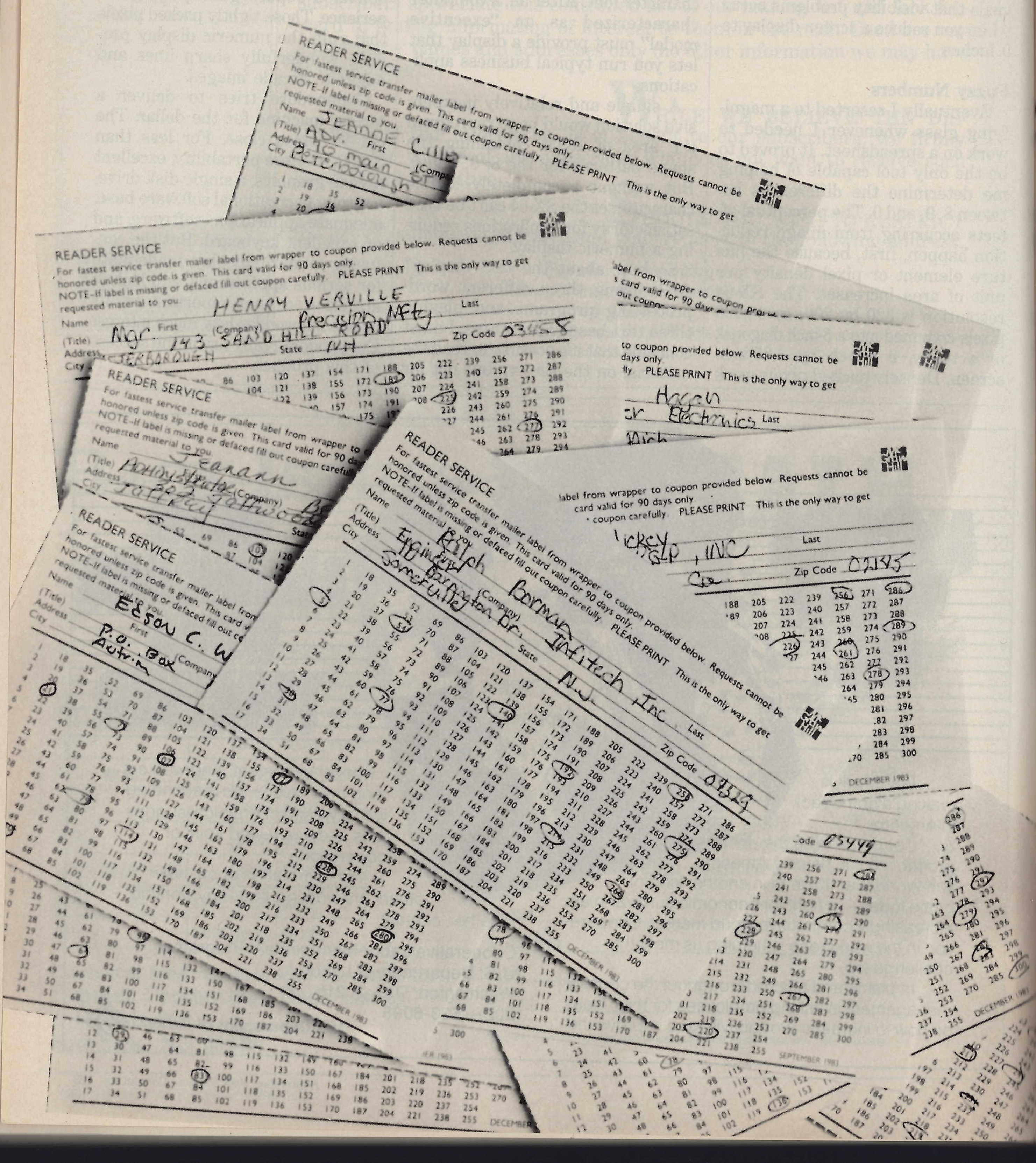

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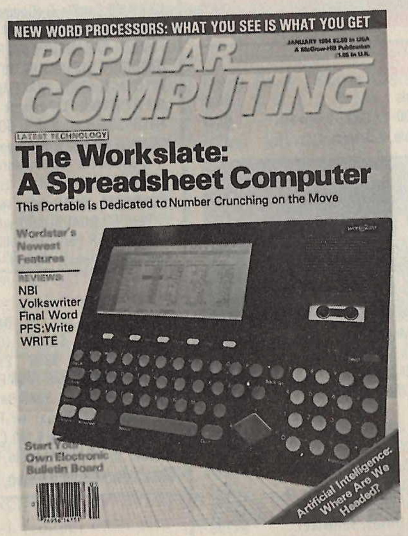
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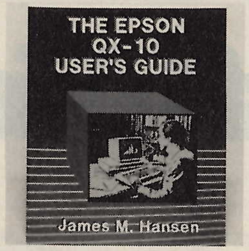

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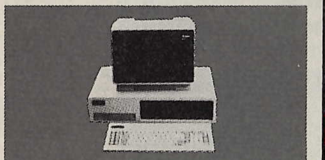

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The MAD-1

Stylish design and fast processing distinguish this IBM compatible

by Phillip Robinson

Touting its stylish MAD-1 as "the BMW of computers," Mad Computer Inc. hopes to snare that part of the personal computer market that is interested in something more than raw productivity. Mad (short for Modular Advanced Design) has given us a machine that adds a distinct stylish flair to basic strengths such as solid engineering, the latest processor technology, and IBM compatibility.

But the MAD-1's elegant look isn't the only thing that sets it apart. The computer runs many of the most popular programs written for the IBM Personal Computer, and it runs them about twice as fast. What's more, a superior keyboard and a well-designed video display make the machine a pleasure to use. You'll pay slightly more for the MAD-1 than you would for a similarly equipped IBM PC, but like the BMW, you get what you pay for.

Chip Switch

The MAD-1 wasn't available in quantity until February of this year, but it has had a long history. First introduced at the Comdex show in the fall of 1982, the early model sported many of the present design concepts but was built around the same Intel 8088 central processor that IBM uses in its PC. Apparently

AT A GLANCE: MAD-1

Manufacturer:	Mad Computer Inc., Building 13, 3350 Scott Blvd., Santa Clara, CA 95051, (408) 980-0840
Uses:	Business and personal computing; local area networking
Standard Features:	Intel 80186 central processor; 256K bytes of random-access memory expandable to 512K bytes on motherboard in 128K-byte increments; 16K bytes read-only memory; two 5¼-inch half-height floppy-disk drives storing 360K bytes each (reads and writes IBM PC disk format); detachable 85-key keyboard with 10 programmable function keys, 14-key numeric pad, and palm rest (17.6 by 8.6 by 1.7 inches); 12-inch amber video display with 25 lines of 80 characters (screen tilts and swivels); two RS-232C serial ports; one Centronics-compatible parallel port; one IBM-compatible expansion slot; MS-DOS 2.0
Base List Price:	$4195
Documentation:	*User's Manual* and *MS-DOS Manual*
Options and Accessories:	Expansion Module (available fall 1984, price to be announced) plugs into standard expansion slot to furnish additional IBM-compatible slots; hard-disk MAD-1 ($6295) with one floppy-disk drive and one 10-megabyte fixed or 5-megabyte removable half-height hard-disk drive; Microsoft GWBASIC ($195)

Phillip Robinson is a software engineer and author of *The Programmer's Guide to the Z80 Chip* (TAB Books, 1984).

Photograph by Michael Carr/Pacific Horizons

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realizing that it would have to offer more than a pretty face, the company completely revamped the machine in April 1983, this time using the newer, more powerful 80186 chip.

The 80186 chip lends greater power in two ways. First, it works significantly faster than the 8088. While the older 8088 processor handles internal operations 16 bits at a time, it communicates with the rest of the computer and any peripherals only 8 bits at a time. Because the 80186 uses 16 bits for all operations, it can move information around nearly twice as fast as the 8088 can. The chip in the MAD-1 also boasts a clock rate of 7.2 megahertz (MHz), significantly faster than the 4.77-MHz rate of the IBM PC's 8088.

Second, the 80186 has integrated most peripheral circuits, drastically reducing the need for auxiliary chips such as timers, counters, interrupt controllers, and the "glue" chips to connect them. The result is not only greater speed than with the old 8088 but also more reliable processing and lower system cost.

These advantages of the 80186 have created a demand that is unprecedented for a new processor. Because Intel simply cannot supply as many chips as manufacturers want, all its customers remain on allocation. However, Mad Computer needs only 20,000 working 80186 processors to produce all of the computers it plans to ship this year, and the company says that it doesn't anticipate any problems getting that many. Mad doesn't have a monopoly on the 80186, though—Durango's Poppy series and the Pronto Series 16 computers are two other designs that also use the new chip.

Not Just for Show

Modular Advanced Design is more than a trio of words forming the acronym MAD: the design concept is indeed modular. The system unit, disk drive, keyboard, and video display are separate units, and their complementary designs and colors make them look good whether they're stacked together or spread out along a desk. But the MAD-1's stylish ap pearance is not mere superficial daz zle. All elements of the machine even its documentation, have bee designed to be easy to use as wel as appealing to the eye.

Mad studied European DIN stan dards for human engineering before establishing parameters for much o the system's ergonomic design. The sleek and trim monochrome monitor that comes with the MAD-1, for example, is very easy on the eyes. It features a large high-resolution screen with a crisp amber display (a green display is also available) and an effective anti-glare mesh. You can easily adjust the viewing angle of the monitor by extending or retracting a support foot at the back.

Even more impressive is the MAD-1's large detachable keyboard, which makes you feel like you're at the controls of a dedicated word processor rather than a personal computer. The keyboard features a typewriter-style layout, a convenient palm rest below the space bar, small bumps on the home keys, and, at the upper left, 10 programmable function keys in two rows. As on the IBM PC's keyboard, a numeric keypad is combined with cursor-controlling arrow keys; you switch functions with the Number Lock key. All keys have what I found to be very comfortable audio and tactile feedback. In short, MAD-1's keyboard is a pleasure to use—I wish I could plug it into my own machine.

Compatible Convenience

Rather than offering applications software of its own, Mad Computer is relying on the many PC-DOS and MS-DOS programs written for the IBM PC. The company's list of programs that run on the MAD-1 contains an impressive, varied collection of software—it even includes Lotus's 1-2-3 and Microsoft's Flight Simulator, generally regarded as two of the most difficult programs for a compatible to run. (See "Compatible Software" on page 131 for other compatible programs.)

But as with any compatible, you shouldn't expect every off-the-shelf

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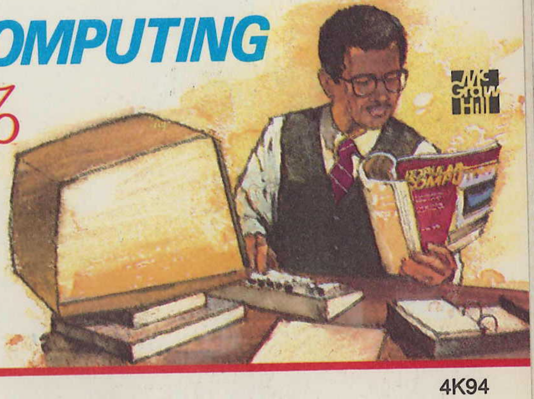

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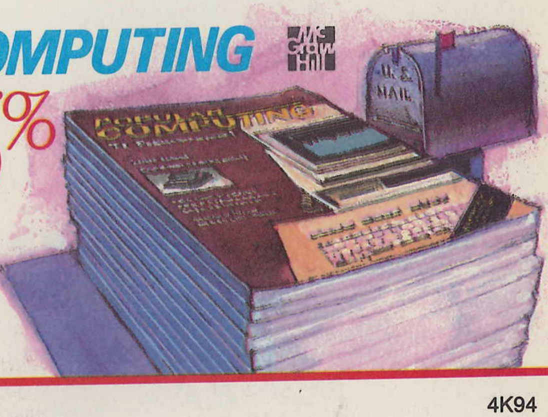

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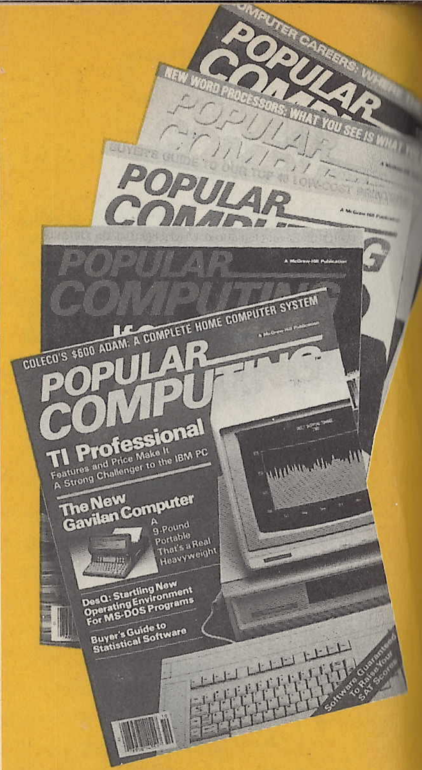
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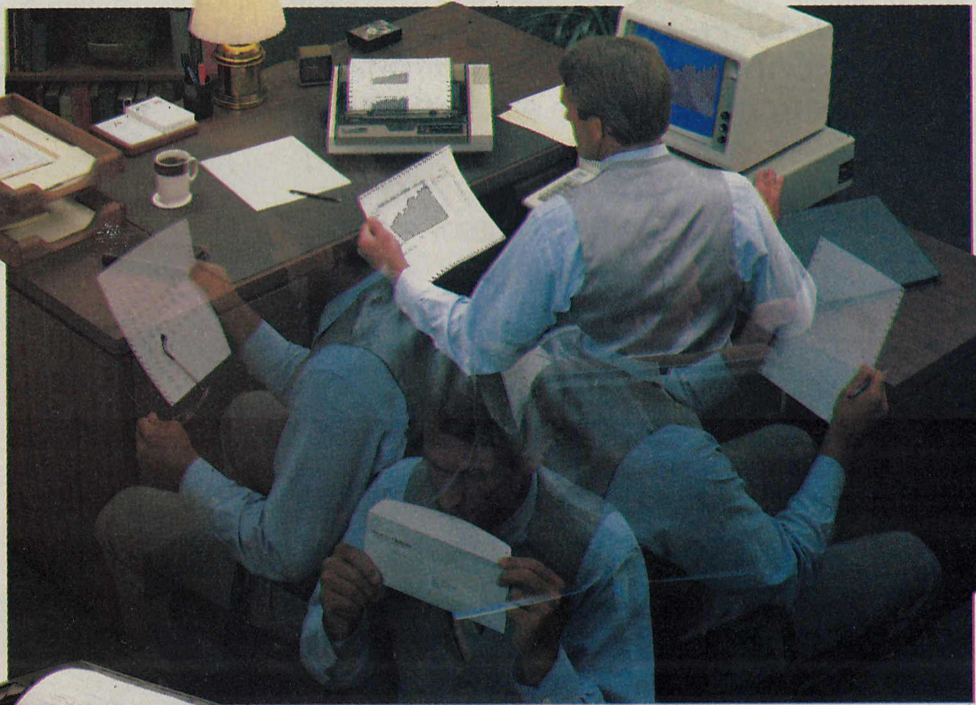

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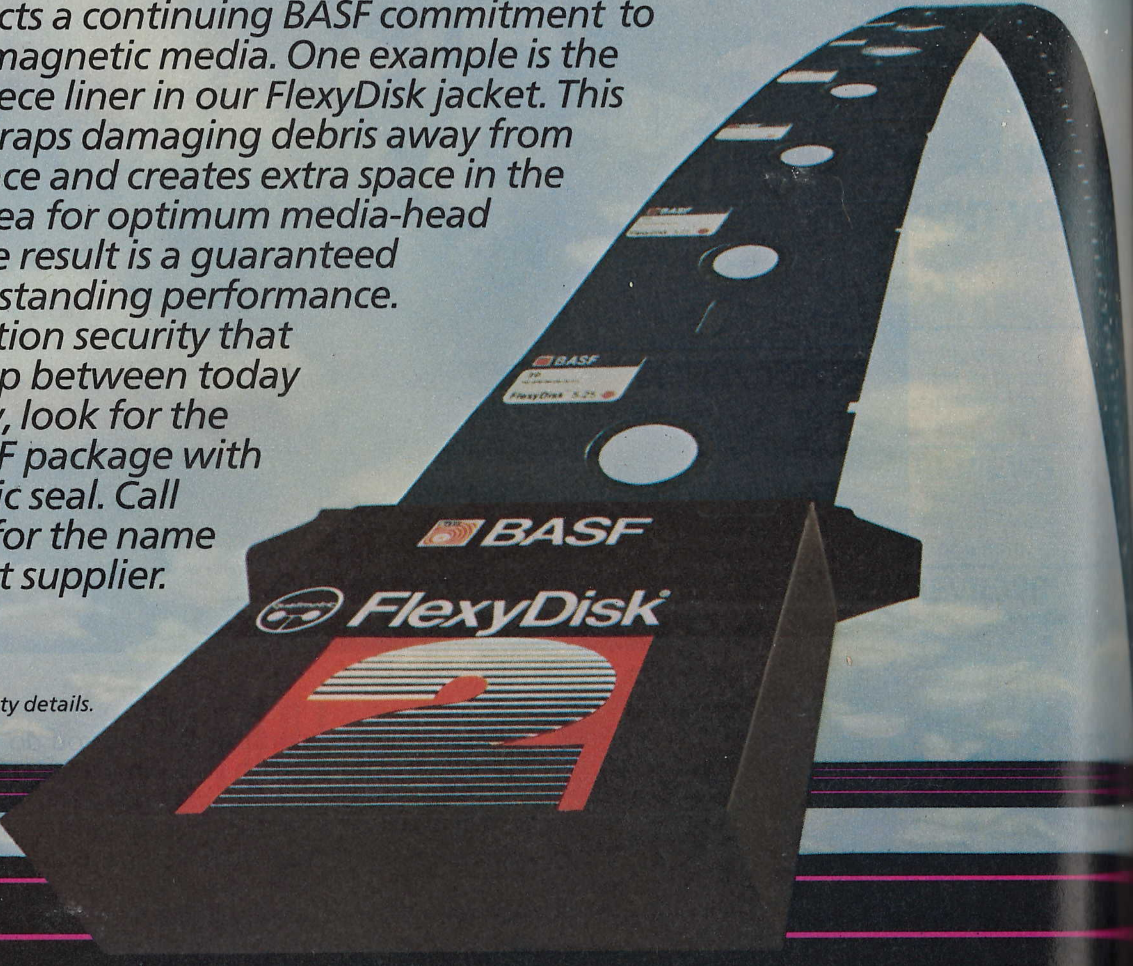

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IBM PC program to work on the MAD-1. I successfully tested Wordstar, Supercalc, and several other programs on the company's list of compatible software, but at least two programs not on the list—Transend Communications and Bluebush Chess—didn't get past first base. Mad attributes most instances of incompatibility to disk-based copy protection schemes.

The MAD-1 can also use many of the plug-in boards designed for the IBM PC. However, because the machine uses the 80186 central processor, you can't add standard memory-expansion boards. But your dealer can expand the standard 256K bytes of random-access memory (RAM) easily enough by plugging RAM chips into special sockets on the MAD-1 system board and resetting some switches. The board has room for as much as 512K bytes of RAM.

Expansion capabilities are rendered less crucial by the fact that many of the options you would normally add to an IBM PC or similar machine are already built into the MAD-1. The system comes with two disk drives, serial and parallel ports, an internal battery-supported clock, and a color-display controller. Supplying these "extras" as standard equipment makes good sense, for nearly everyone who uses a 16-bit personal computer will want them. Thus the MAD-1's $4000 price tag seems reasonable—it's very nearly the same as the cost of a similarly equipped IBM PC (although some compatibles can undercut this significantly).

There is still some room for options, though. Mad does not offer a color display, but you can use the machine's built-in color-display controller to drive any off-the-shelf color monitor. The company does offer a model with a hard-disk drive installed in place of one of the floppy-disk drives; this hard-disk version of the system also comes with 256K bytes of RAM.

Also of note is the MAD-1's compatibility with at least two local area networks: PCNet and the faster but more expensive Ethernet. This means that as many as 1024 MAD-1 computers and compatible devices can be linked to each other and to shared resources like file servers and mass-storage facilities. Because the cost would be spread over many workstations, such a network would justify expensive peripherals like laser printers.

Considering the MAD-1's full load of standard features, the machine's $4000 price tag seems reasonable—it's very nearly the same as the cost of a similarly configured IBM PC system.

Rounding out the MAD-1 system are two manuals that are as easy to use as the hardware itself. The user's guide is written for those who have never operated a computer, and its clean, open design minimizes the intimidation a beginner naturally feels about getting started. Once the user is up to speed, the MS-DOS reference manual provides higher-level guidance in operating the system.

All told, the MAD-1 is a powerful and attractive computer system that has been designed with lots of attention to detail. Its compatibility with many programs written for the IBM PC gives it instant access to top-selling software, and its impressive processing speed, great keyboard, and excellent video display make it a pleasure to work with. Granted, the system is a bit more expensive than most of its competitors—if you're a bargain hunter, you'll want to look elsewhere. But if you go for the style and quality offered by top-of-the-line products, you'll go for the MAD. □

Compatible Software

Mad Computer Inc. has tested the following programs written for the IBM PC and found that, without reservation, they will run on the MAD-1.

Integrated Software
- 1-2-3 (1A)
- Supercalc3 (1.0)
- Supernet

Word Processors
- Wordvision
- Easywriter II (2.0)
- Superwriter (1.0)
- Wordstar (3.30)
- Mailmerge (3.30)
- Spellstar (3.30)
- Perfect Writer (1.0)
- Volkswriter (1.206)
- New Word
- Multimate

Spreadsheets
- Supercalc2 (1.0)
- Easyplanner (1.0)
- Perfect Calc (1.11)
- Intecalc
- Multiplan (1.1)

Database/File Management
- Condor 3 (2.1)
- dBASE II (2.4)
- Easyfiler (1.0)
- Perfect Filer (1.00)
- MAG/base 3
- COBOL
- DAYFLO
- Qbro-4
- Personal Pearl
- Financier
- The Advocate

Accounting
- Software Fitness Program (2.0)

Communications
- Crosstalk XVI (3.2)
- Microterm (1.43)

Miscellaneous
- Calc Aid II+ (2.0)
- Calc Aid III
- Personal BASIC
- MECA (educational)
- Thinktank Demo
- Victor 9000 Emulator
- VENIX (1.0HD)
- IDM-X Demo
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The Kimball Z-50 Musicplus Organ

The Z-50 Musicplus, from Kimball, is a home organ that features its own on-board microprocessor and green-phosphor display screen.

Priced at $6000, the unit includes 16K bytes of read-only memory (ROM), 48K bytes of random-access memory, a numeric keypad, a cassette interface (for recording data and music) and a ROM cartridge slot. Accompanying cartridges provide music lessons, games, and a demonstration routine. An optional modulator allows the Z-50 to display color graphics on a television.

Other Z-50 features include an extensive array of musical effects and simulated instruments, two 44-note manuals, preset rhythms, and a matching upholstered bench. The organ's "Pro Entertainer" feature lets beginners play with just two fingers.

Additional information is available from Kimball International Keyboard Div., 1600 Royal St., Jasper, IN 47546.
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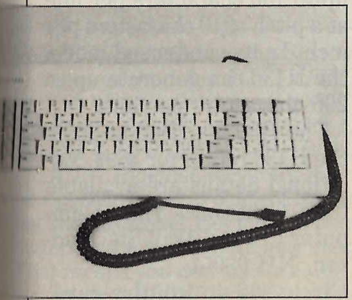
Data Spec Keyboard

The Data Spec detached keyboard for Apple II and II Plus computers

Unhappy with your Apple II or II Plus's built-in keyboard? The Data Spec Detached Extension Keyboard is a low-profile unit that offers a 10-key numeric keypad, an adjustable tilt stand, and a 10-foot coiled extension cable.



The keyboard also features a full ASCII character set with uppercase and lowercase letters and 97 preprogrammed functions and commands, 20 of which are located on a separate keypad for easy access. The unit retails for $299.95.

For complete information, write Alliance Research Corp., 18215 Parthenia St., Northridge, CA 91325.
Circle 201 on inquiry card.

Starting a Dialog

The Dialogic Voice System for the IBM Personal Computer

The Dialogic Voice System is a plug-in card and software package that provides the IBM Personal Computer with true speech capability. The System digitizes speech in real time and stores the information on disk for playback at a later time. Features include an unlimited vocabulary, high-fidelity tonal qualities, a programmable volume control, and user-selectable compression and fidelity rates. Applications include voice-annotated word processing, computer-aided instruction, voice mail, and remote messaging and data entry.

The system comes in three configurations. Dialog/1, the basic model, is priced at $295. Dialog/2, which includes telephone auto-dialing and auto-answering capabilities, retails for $495. Dialog/3, with an on-board intelligent modem and Touch-Tone decoder, sells for $595.

Complete details are available from Dialogic Corp., 164 McKinley Ave., East Hanover, NJ 07936.
Circle 202 on inquiry card.

NEW PRODUCTS

Putting It Briefly

The Sord IS-11 portable computer

Sord's IS-11 is a briefcase-sized portable computer that offers 32K bytes of nonvolatile random-access memory (expandable to 64K bytes), an 8-line by 40-character bit-mapped liquid crystal display, and a standard typewriter keyboard. The system weighs under 5 pounds and measures $11\frac{13}{16}$ by $8\frac{7}{16}$ by $1\frac{7}{16}$ inches.

The $995 unit also features an RS-232C interface, a built-in data recorder, six function keys, and an AC adapter/battery charger. Rechargeable nickel-cadmium batteries enable the computer to operate for up to 8 hours per charge. The IS-11 offers an extensive array of built-in software, including an electronic spreadsheet, word processing, telecommunications, data processing, and graphics applications, all with multiwindowing capability. The system also accepts plug-in read-only memory cartridge programs.

Additional details are available from Sord Computer of America Inc., 645 Fifth Ave., New York, NY 10022.
Circle 203 on inquiry card.

Hot Chips

The Compu-Fire computer system fire extinguisher

Compu-Fire is a rechargeable fire extinguisher that's designed for use on computers and peripherals. The unit, which is 10 inches high and weighs 2¼ pounds, contains 20 ounces of Halon 1211, a fire-fighting agent that produces no static electricity upon discharge and leaves no harmful residue.

Other features include a chrome-plated DOT steel cylinder, an aluminum valve assembly, a pressure gauge, and a UL 2B:C rating. The $50 extinguisher is shipped with a wall bracket and owner's manual.

More details are available from Protectall Corp., Dept. 17, 5422 Page Dr., Pittsburgh, PA 15236.
Circle 204 on inquiry card.

New Horizons

Centronics' new pair of dot-matrix printers

Centronics has unveiled its Horizon series of dot-matrix units for use in small systems and personal computer applications. Both printers provide downloadable character sets and pin-addressable graphics.

The model H80 is a parallel-based printer that offers an 8-inch print line and a typewriter-style font, as well as roll, cut-sheet, and fanfold paper-handling capabilities. The unit also features draft- and near-letter-quality print settings (at 160 and 27 characters per second, respectively), true subscripts and superscripts, and enhanced, overstrike, condensed, pica, elite, and expanded print modes. An optional RS-232C interface is also available.

The Model H136 printer, in addition to having the H80's features, is capable of printing up to 156 characters per line at a pitch of 10 characters per inch. In its condensed mode, the H136 can generate up to 266 characters per line.

The H80 is priced at $699; the H136 retails for $899. Additional details are available from Centronics Data Computer Corp., 1 Wall St., Hudson, NH 03051.
Circle 206 on inquiry card.

Rainbow Revised

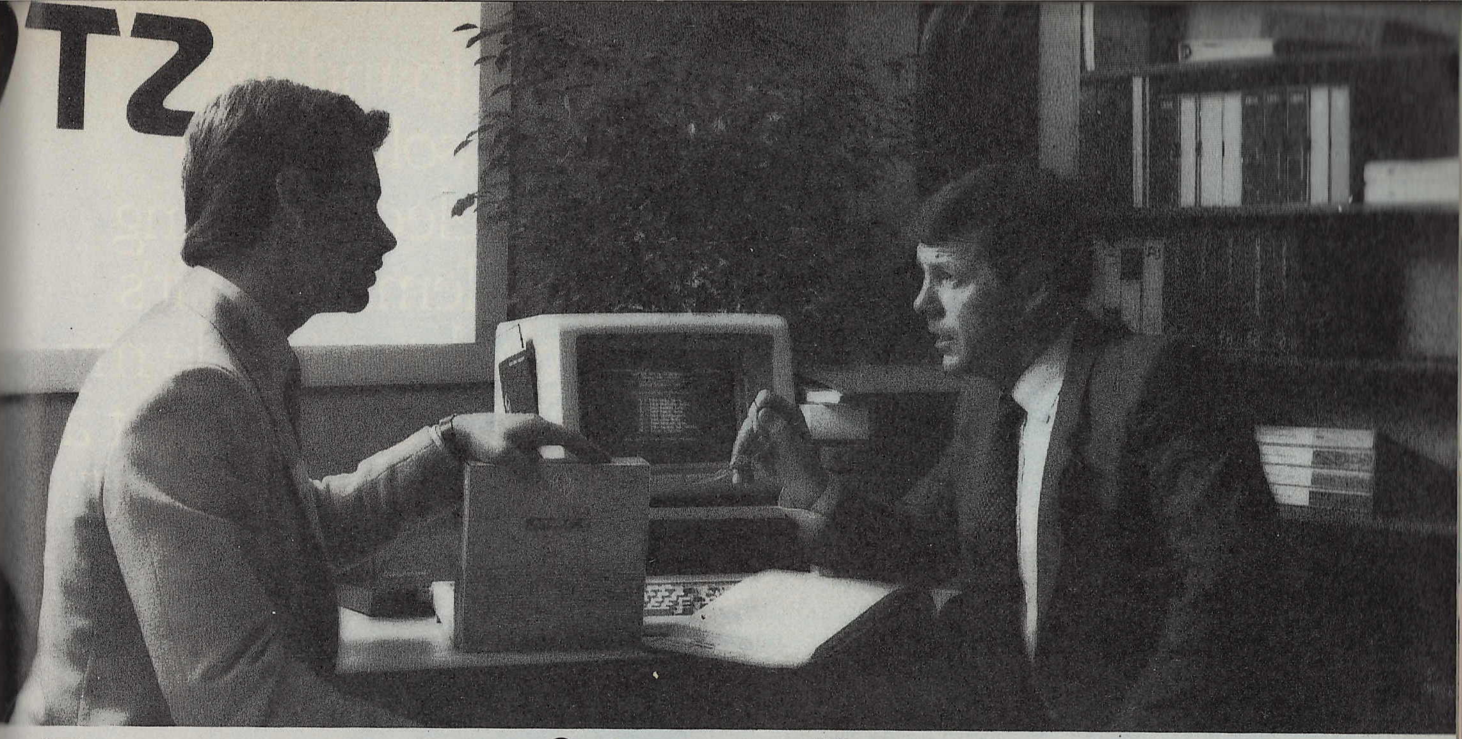
DEC's Rainbow 100B desktop computer

Digital Equipment Corp. has unveiled the Rainbow 100B, a desktop computer that offers twice the base memory (128K bytes) and four times the expansion memory (768K bytes) of the Rainbow 100.

Standard features on the 100B include Z80A and 8088 microprocessors, dual 5¼-inch floppy drives, synchronous and asynchronous communications interfaces, and a printer port. The system can display as many as 16 colors or monochrome shades from a palette of 4096 colors. Improved versions of the CP/M-80, CP/M-86, and MS-DOS operating systems provide a floppy-disk formatter, a memory-based disk simulator, and software support for a hard-disk drive.

The Rainbow 100B base system unit is priced at $2750. A monochrome monitor ($325) and keyboard ($245) are also available.

For further information, contact Digital Equipment Corp., Maynard, MA 01754.
Circle 205 on inquiry card.



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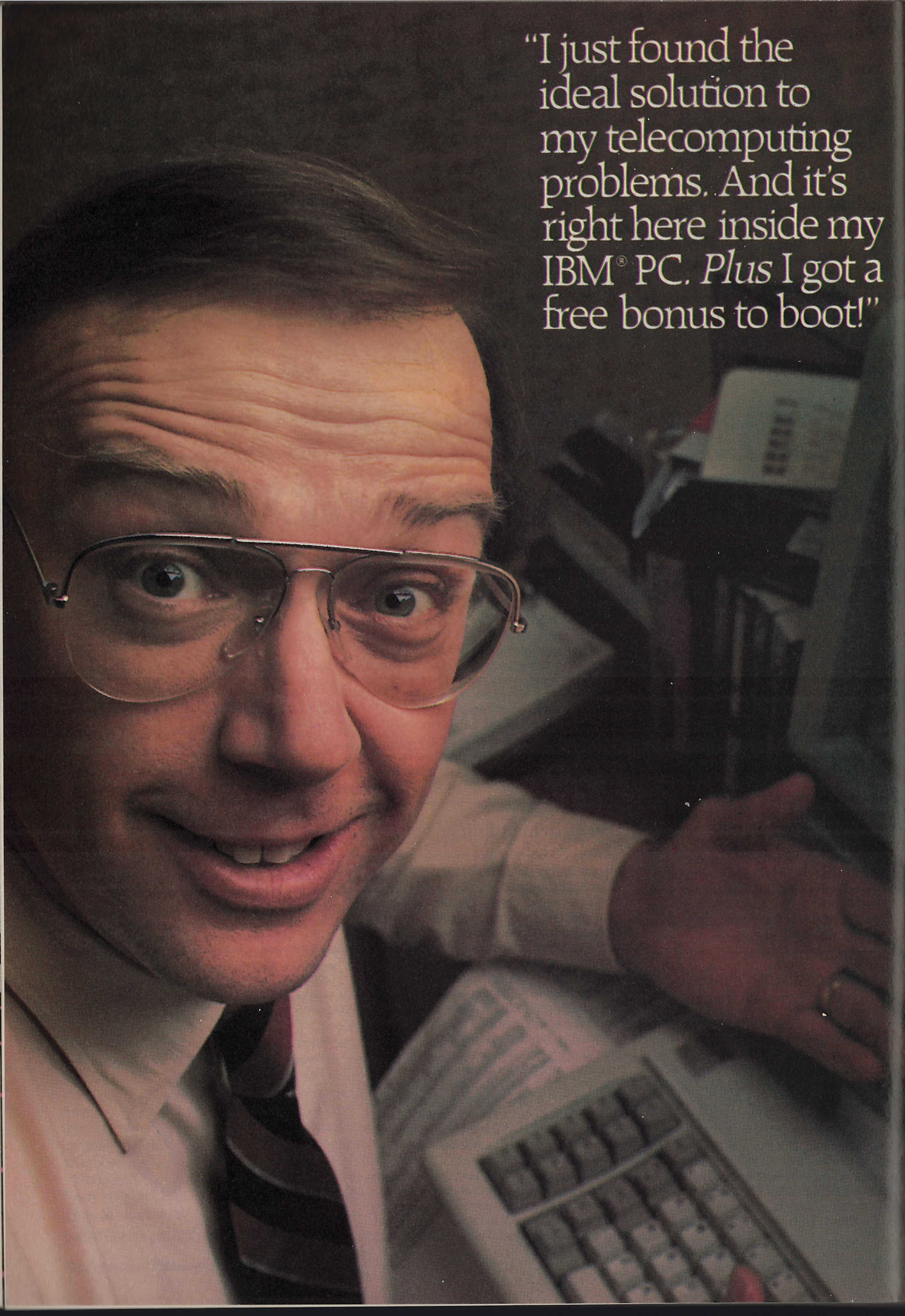
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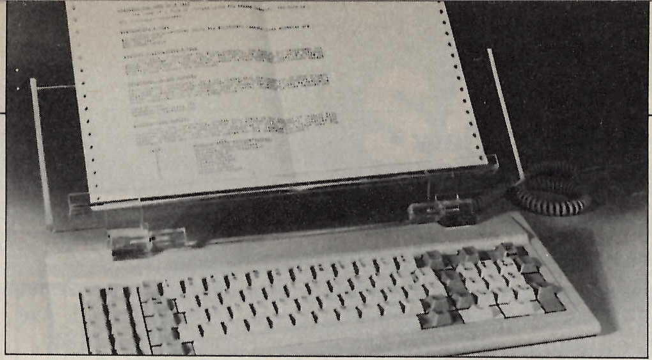

Copy Cover

A keyboard dust cover and copy holder

Copy Cover is a keyboard dust cover that flips up to become a convenient copy holder. The clear lucite unit clips on and off in seconds and accommodates documents and computer printouts measuring up to 11 by 16 inches. Versions are available for most popular computers, including briefcase-sized portable systems. Copy Cover retails for $39.95. Further information is available from C-Thru Products, Suite 111, 6351 Lake Worth Rd., Lake Worth, FL 33463.
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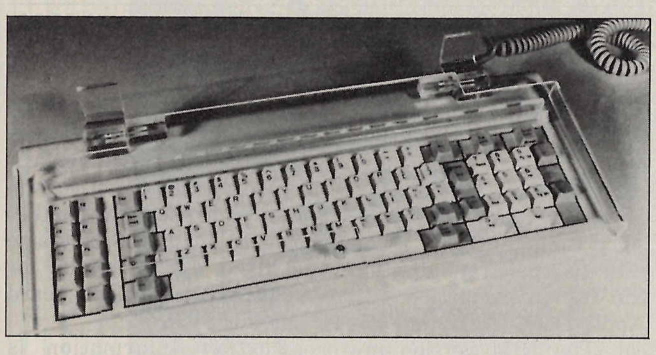


Calltext 5000

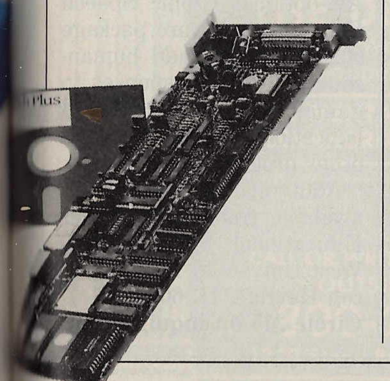
Let your IBM Personal Computer or XT convert text to speech

Speech Plus has introduced a text-to-speech converter and telephone interface board for the IBM PC that lets users access text data in voice through any Touch-Tone telephone.

Calltext 5000 provides voice output with an unlimited vocabulary. It can be programmed to answer a telephone, obtain text data from a host computer, and supply text data in voice to callers. Applications include the retrieval of electronic mail, factory messaging, operator prompting, and proofreading.

Features include compatibility with the IBM PC XT's bus interface, an RS-232C interface port, automatic dialing and answering capabilities, and an on-board amplifier that can drive an external speaker. Callable I/O drivers facilitate the writing of programs in BASIC, C, and assembly language under MS-DOS. Calltext 5000 retails for $2700, including interface software.

More information is available from Speech Plus Inc., 461 North Bernardo Ave., Mountain View, CA 99043.
Circle 210 on inquiry card.



For Junior Only

Four new add-ons for the IBM PCjr

Tecmar Inc. has unveiled four add-on memory and peripheral cards that fit onto the side of the PCjr.

Jr Captain offers an IBM-compatible printer port, a clock/calendar with battery backup, and up to 128K bytes of random-access memory (RAM). The card is priced at $235 (with no additional memory), $315 (with 64K bytes of RAM), and $395 (with 128K bytes of RAM).

Jr Wave is a memory board that holds up to 256K bytes of RAM. It is priced at $295 (64K bytes), $375 (128K bytes), $445 (192K bytes), and $495 (256K bytes).

Jr 2nd Mate, a $145 communications card, combines an IBM-compatible printer port and a clock/calendar with battery backup.

Jr Cadet complements the Jr Captain and Jr Wave boards by providing up to 384K bytes of additional RAM. It is priced at $195 (64K bytes), $275 (128K bytes), $445 (256K bytes), and $595 (384K bytes).

Further details are available from Tecmar Inc., 6225 Cochran Rd., Solon, OH 44139.
Circle 208 on inquiry card.

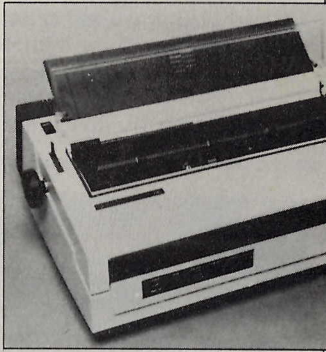
Sail on, Silver Reed

The Silver Reed EXP 770 letter-quality printer

Silver Reed has unveiled the EXP 770, a daisywheel printer that offers letter-quality output and a print speed of up to 36 characters per second.

Other features include a 2K-byte memory buffer (expandable to 48K bytes), bi-directional printing, sub- and superscripts, and boldfacing. The EXP 770, which emulates the Diablo 630 printer, sells for $1295.

Additional details can be obtained by writing to Silver Reed America Inc., 19600 South Vermont Ave., Torrance, CA 90502.
Circle 209 on inquiry card.



Multifunction Multicomputer Card

PC Handler provides local networking and added features

The PC Handler, a plug-in multifunction card for the IBM Personal Computer, links as many as four IBM PCs, PC compatibles, or Apple II family computers into the same resource network. The card allows connected computers to share common files and peripheral equipment. PC Handler also offers two serial ports, four parallel interfaces, an expandable random-access memory, a clock, and integral software and disk emulation for fast file searches.

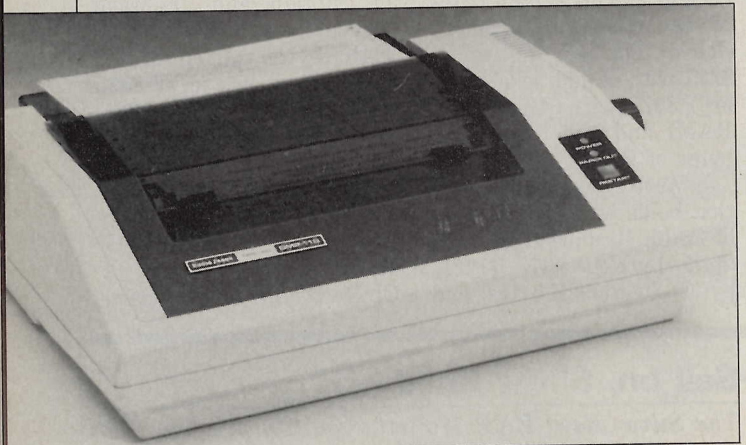
For additional details, including price, contact Synetix Inc., 10635 Northeast 38th Pl., Kirkland, WA 98033.
Circle 211 on inquiry card.

Radio Shack DMP-110

The Radio Shack DMP-110 dot-matrix printer

Radio Shack's DMP 110 dot-matrix printer offers correspondence-quality, data processing-quality, and bit-image graphics print modes.

Priced at $399.95, the unit features underlining, simulated sub- and superscripts, elongated and condensed print modes, a graphics resolution of 960 dots per line (with dot-addressable 7- or 16-dot columns), and a variety of built-in fonts. In its correspondence-quality mode, the printer offers a print speed of 25 characters per second and pitches of 10 and 12 characters per inch. While in the data-processing-quality setting, it provides a speed of 50 characters per second and pitches of 10, 12, and 17 characters per inch. The DMP-110 handles paper widths ranging from 4 to 10 inches and is equipped with parallel and serial interfaces. For more details, write Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.
Circle 214 on inquiry card.



Parallax View

Axiom's Parallax-TI parallel printer interface for the TI-99/4A

Parallax-TI is a compact expansion interface that lets TI-99/4A owners connect parallel-type printers to their computers.

Priced at $99, the unit plugs neatly into the side of any TI-99/4A console and includes a cable that connects to a printer's interface port. Parallax-TI is compatible with all TI software, including cartridge programs. Units can be daisy-chained through a built-in edge connector.

For details, write Axiom Corp., 1014 Griswold Ave., San Fernando, CA 91340.
Circle 212 on inquiry card.

Hard-Disk

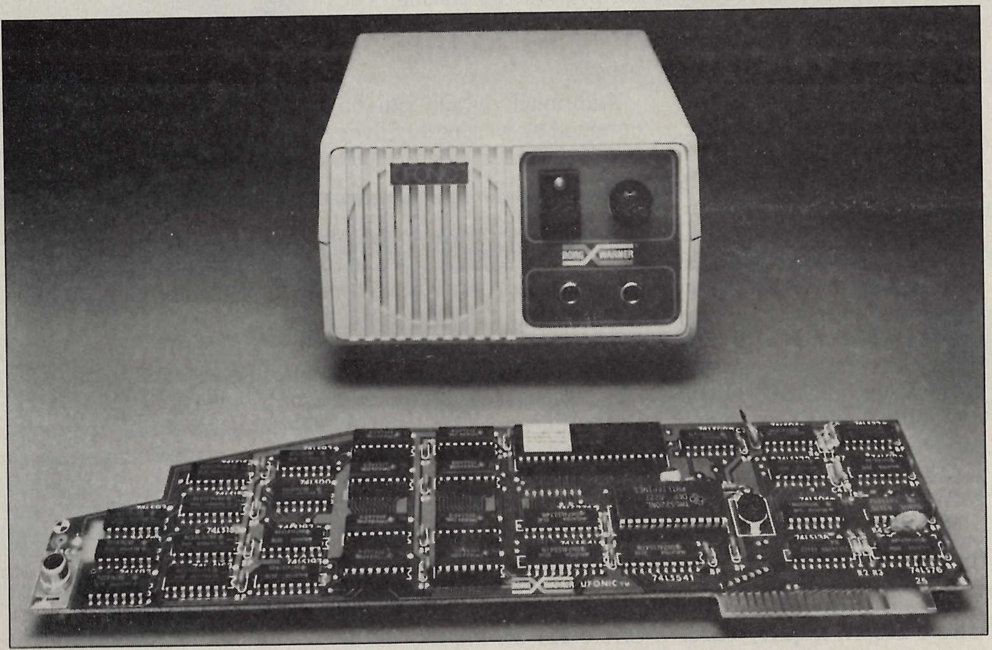
A removable hard-disk drive for Apple II and IBM Personal Computer systems

Digital Electronic Systems has unveiled Hard-Disk, a 5-megabyte removable hard-disk drive for the Apple II and IIe and the IBM Personal Computer.

In its Apple configuration, the drive is compatible with Apple DOS, CP/M, and Pascal. The IBM version provides the same I/O bus interface as the IBM PC XT and supports all PC disk commands plus extensions. An optional interface board allows the IBM version or a Winchester system to operate on an Apple II or vice versa.

The Hard-Disk, with a two-drive controller that handles any combination of removable or fixed drives, retails for $1295. The interface board sells for $149.

Further information is available from Digital Electronic Systems Inc., 107 Euclid Ave., Mountain Brook, AL 35213.
Circle 213 on inquiry card.

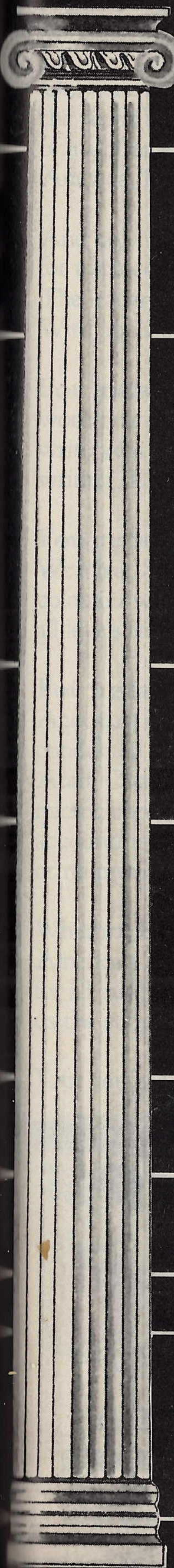


Euphonious

The Ufonic Voice System

The Ufonic Voice System is a speech synthesizer for the Apple II and IIe. The $495 system consists of a plug-in circuit card and an amplifier/speaker that fits neatly on top of a disk drive. An optional Ufonic Speech Composer software package ($225) lets you add human-sounding voice responses to games, computer-assisted educational programs, and other programs.

Additional information is available from Borg-Warner Educational Systems, 600 West University Dr., Arlington Heights, IL 60004.
Circle 215 on inquiry card.



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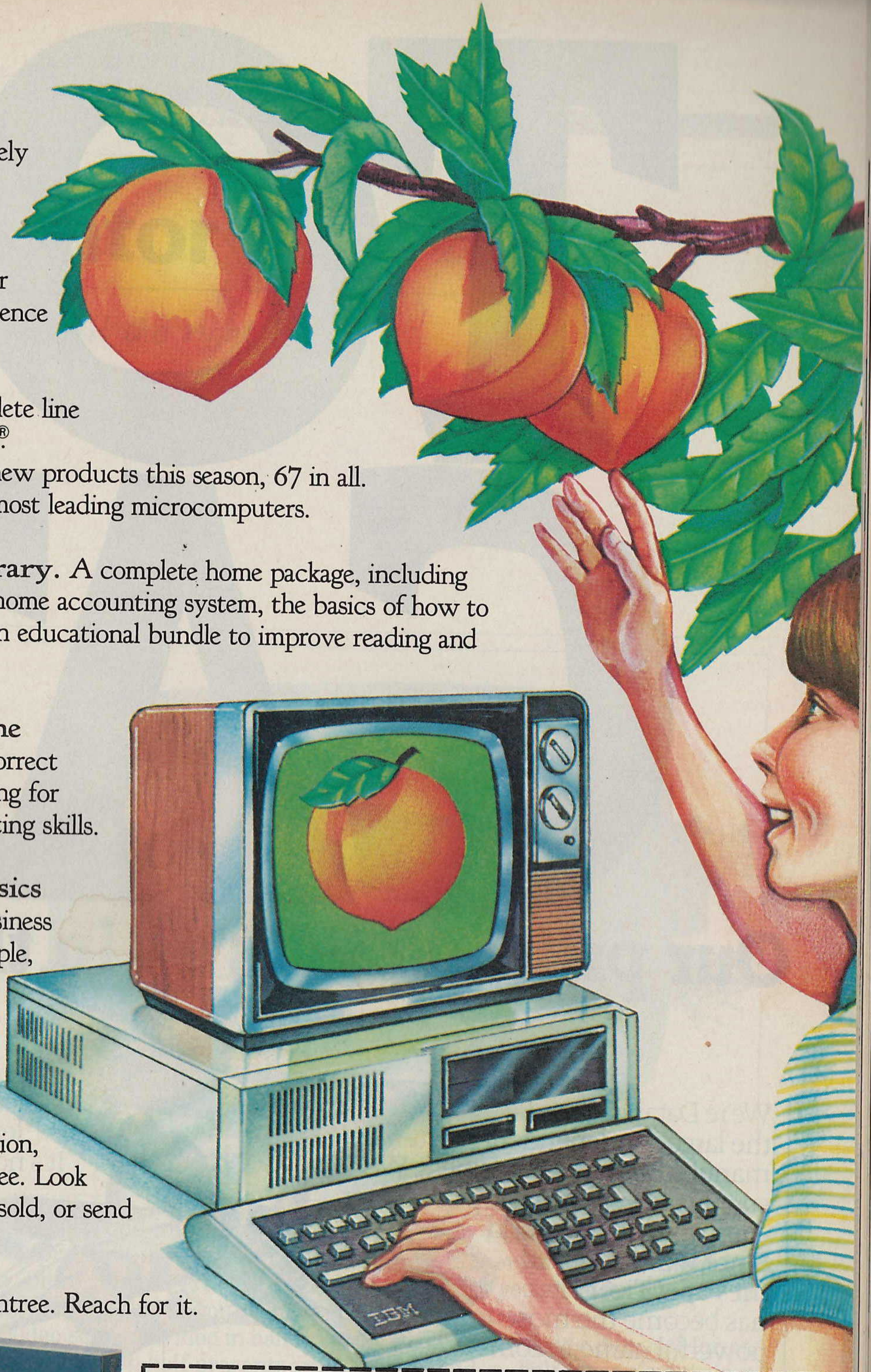

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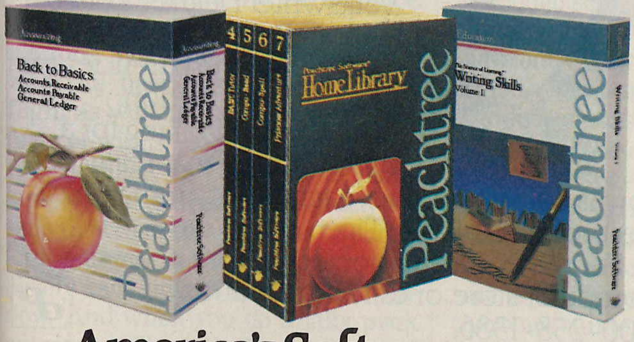

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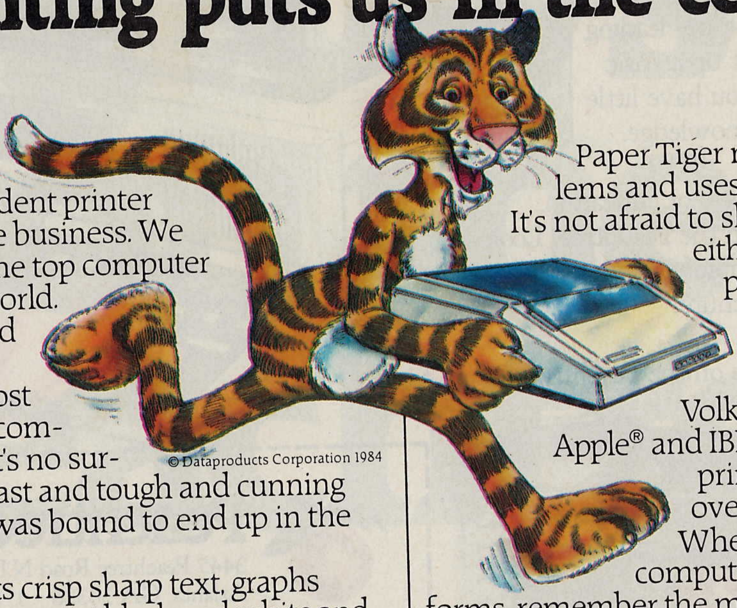

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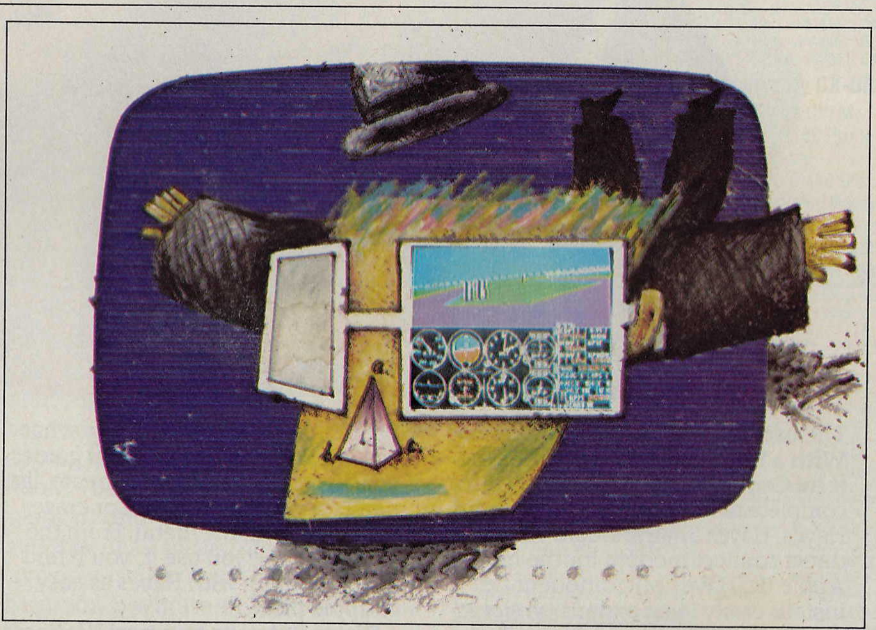
Flight Simulator II

This game—dare I say it?—has all the right stuff

by Joseph J. Elia Jr.

A few months ago, at the end of a commercial flight into Boston, I turned to my seatmate and said in an offhand way, "He's coming down way too fast." Sure enough, when we hit the runway, we bounced our way to a stop.

I earned my license as a "backseat flier" with the first version of Bruce Artwick's Flight Simulator, which came on the market in 1979. Now after having spent the past few weeks with Flight Simulator II, I feel even better prepared to critique a pilot's overaggressive descent or a climbing turn that's just a bit too tight. Next time up, I should be a real scream to sit beside.



FS II turns a microcomputer into a powerful instrument of fantasy and uses it to demonstrate a complex, real-world skill. This new incarnation of an old favorite represents not merely a revision, but an advance. Now amateur fliers can jockey ailerons, flaps, and elevator trim tabs into the best positions for stable flight as well as wrestle with the effects of winds, clouds, darkness, low fuel supplies, and burned-out panel lamps. Indeed, there are so many details to attend to—switches to throw and gauges to watch—that you'll barely have time to look out the window. And when you do finally peek outside you'll see the landscapes and cityscapes that make the simple gridlines and two-dimensional mountains of the first version of the program look crude in comparison.

This program puts you in control of a Piper Archer II. As you're ready to begin flying, you're looking at a video screen divided in half horizontally. The top half presents your view out the windows. The bottom half, the instrument control panel, contains six basic flight instruments grouped in the standard cluster. You have an airspeed indicator, attitude indicator or artificial horizon, altimeter, turn coordinator, heading indicator, and vertical-speed indicator or rate-of-climb indicator. In addition, there are numerous knobs, needles, controls, and gauges that will demand your close attention.

Game time is real time. One of my more memorable flights was a five-hour trip from Chicago to the Big Apple. Excerpts from my flight log should give you a feel for what FS II is all about.

"Have been flying due east for an hour and a half over featureless ground. Lake Michigan is far behind me, and I'm trying to Lindbergh my way to the Atlantic . . . My calculations put me on a course for New York City, but all I can see is green screen—I'm flying over the graphics wasteland between Chicago and New York City. My airspeed is 120 knots.

"The horizon starts playing tricks on me about two hours into the

---

Joseph J. Elia Jr. is the manager of editorial operations at *The New England Journal of Medicine* and a frequent contributor to *Popular Computing.*

Illustration by Maciek Albrecht

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flight. I think I can see hints of Artwick's cityscapes out there, but it's nothing but stray pixels suggesting the horizon. The course changes by a full degree, and it's cause for alarm. What to do? I keep feeding tapes into my portable tape player—Haydn and Bowie—got to keep alert just in case an unexpected air pocket tries to take me down. I don't dare leave the controls.

"Almost two and a half hours into the flight, I can no longer stand the clicking sound that the engine makes, so I crawl into the editor and disable it. Four hours . . . the craft goes into a steep dive about five minutes after I'd changed the fuel tank from left to right. We're at 4500 feet after going above 7000; most of the altitude was lost in the mysterious dive. Four hours and forty minutes . . . the compass reading changes abruptly from 90 to 110, thus indicating that I've moved into the airspace controlled by New York. I feel exhilarated: I'm almost there."

But *almost* wasn't enough, and all I ever saw of New York that night was the black scar of the simulated Hudson River. In all the excitement I tried to store my flight position on a disk, but the save was unsuccessful. So I missed my chance for a triumphant landing in the Big Apple and disappeared from the skies somewhere over Manhattan. You don't have to quit the game whenever you want to take a break; the pause feature will hold the action until you're ready to resume play.

At a Glance

Name: Flight Simulator II

Type
Computer-simulated flight

Manufacturer
Sublogic Corporation
713 Edgebrook Dr.
Champaign, IL 61820
(217) 359-8482

Price
$49.95

Format
5¼-inch floppy disk

Computer
Apple II and IIe, Atari 400, 800, and XL series, and the Commodore 64; black-and-white or color monitor; joystick optional

Documentation
90-page flight manual and a booklet containing eight flight lessons

Audience
Pilots and would-be pilots

Post-Flight Debriefing

A disappointing ending, true, but a wild ride nonetheless. That sort of extended flight just wasn't possible with the old game. I would spend many minutes spiraling upward to gain altitude over the grid; then, when the temptation to look down became too great I'd put the craft into a dive and end up tearing off a wing and tumbling out of the sky.

FS II's wings are firmly attached, however. This is not the primitive biplane of the first version, but a sleek, modern aircraft. Not only are the wings reliable but your view is expanded. You're not restricted to looking out the plane's front window. You can look out the sides, to the rear, and at all the major angles in between. You can even look straight down, seemingly through a glass floor. There's radar, which you can zoom in and out to examine things in detail or to place them in perspective on a larger map. Tunable radios help you navigate or land at any of the 80 airports. You can choose from major fields such as Chicago's O'Hare and those in Boston, New York, Seattle, and Los Angeles or small landing strips, useful in emergencies.

To the envy of real pilots, FS II lets you control various flight conditions. You can choose your home airport, the season of the year, the weather, the altitude at which clouds will occur. You can start your flight from ground level or in mid-air. You can set an altitude variable in the editor and start off a few thousand feet up, but remember to tell the editor that your engine should also be on at that height.

You can also control how difficult the flight will be. FS II offers an easy mode for beginners, in which

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the aircraft is forgiving of certain misjudgments involving flight control, engine control, and navigation. The reality mode offers more sophisticated simulation features. Clearly, designer Artwick has striven for variety and flexibility. For aficionados of aerial combat, he's even thrown in a World War I Ace game that pits you against a computer-controlled enemy squadron.

Graphics Surprises

After takeoff you may notice some familiar landmarks below. Flying out of La Guardia, for instance, you can bank left over Manhattan to see the Empire State Building, and off in the distance you'll spot two little sticklike blips at the tip of the island—the World Trade Center towers. As you get closer, the towers acquire more detail. And if you can't resist the temptation to fly between them, don't worry, there's enough room. But be careful, a misjudgment will slam you into one of the towers and end your flight. (Crashes on FS II are less dramatic than they were with the first version, in which the bad news arrived as a screenful of vibrating "CRASH!"; now the end is announced with the same "CRASH" message but the presentation is more subtle.)

Graphics surprises abound. A search of the Seattle area reveals the Space Needle, a remnant of the 1962 World's Fair; Chicago offers the Sears Tower, easy to crash into; and the farmland of central Illinois contains a large-scale geometric patchwork of plowed fields. Not every area has been filled in, however; hence the graphics desert between Chicago and New York. I haven't taken off from every field on the disk yet, so I have much to explore still. I'm anxious to see whether Artwick has stuck a "Hollywood" sign somewhere outside Los Angeles. According to him, even more graphics are on the way. In a telephone interview he said that Sublogic plans to issue disks of detailed ground features that will cover large areas of the United States. He seemed delighted at the prospect of digitizing Washington, D.C.—"all those monuments."

Coming Down Again

Now for the big question. Just how easy is it to fly the Piper? Well, despite the fact that my review copy of the program was missing the booklet containing the flight lessons, I didn't have much trouble. (The Flight Physics and Aircraft Control booklet is now available.) I found enough information in the flight manual for enjoyable, if unschooled, aeronautics; after 20 or so failed takeoffs I had the hang of things.

But to preserve the full fantasy of computer flight, you're going to have to deal with landing your craft. And it seems an impossibility because there are so many gauges to watch in addition to your major worry—the ground. I expect that most beginning fliers will follow my example and avoid airports at first. I prefer to come down in the middle of an open field, where you don't have to bother with annoying details like runways and landing clearances. Listen, a landing is a landing, and a great relief no matter where it happens. But with practice, you'll be hitting the ground with barely a jolt and rolling to a smooth stop on runways both big and small.

I'd like to offer a final tip, one that may prevent you, too, from disappearing out of the skies at the climax of an epic flight. The instructions for saving flight data may mislead you unless you remember that one set of instructions saves data for single flights (the "S" and "SHIFT +" commands in the Apple version), while another set (CONTROL-Z and -X) allows you to store and recall whole sets of these flight situations. Artwick admitted that the manual is "a little unclear" on this point.

That is the only substantive criticism I can offer. This program—dare I say it?—has all the right stuff. □

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Harvard Project Manager

This planning tool uses CPM and PERT techniques to help managers work more efficiently

by George F. Goley IV

Harvard Project Manager is a planning tool whose name aptly describes its function. This program from Harvard Software Inc. is designed to help managers control projects efficiently and productively. Charts, schedules, and calendars help managers oversee projects ranging in size from the very small and simple to the extremely large and complex. Implementing most of the Critical Path Method (CPM) and Program Evaluation and Control Technique (PERT) methods of project planning, Harvard Project Manager gives microcomputer users the luxury of working with sophisticated management tools.

Specifically, this program can help managers more wisely allocate resources and time in the following ways. By helping managers plan work loads in advance, Harvard Project Manager (HPM) can help them avoid costly logjams caused by poorly scheduled work assignments. By comparing budgeted and actual costs, the program can help managers keep finances under control. By identifying crucial project periods in which lost time will result in a delay in completion, HPM can help managers meet deadlines. By allowing managers to work out in advance the personnel and financial resources required by the project, HPM can help managers acquire necessary funding or personnel to assure satisfactory performance. And by identifying the resources required by the project, HPM can help managers decide whether to accept or reject additional responsibilities based on available resources.

How Does It Work?

HPM describes a project in terms of three concepts: the project, a task, and a milestone. It defines a project as "a series of related activities directed toward a specific goal and completed within a specific timeframe." Within a project, a task is "any specific activity with a well-defined beginning and end, and a more or less predictable duration and cost." And a milestone is a "specific event in time that is 'objectively describable,' " meaning that it's obvious that something has occurred. If you can break your project down into these terms, then HPM should work for you.

To use the program you enter information in forms that contain labeled fields. You can describe projects and tasks in terms of actual and planned duration from a minute to a year; personnel allotment; and costs. Tasks are further defined by their relationship to other tasks. Milestones require their own time and relationship definitions. This is obviously a sizable amount of information to collect and analyze. And if HPM did nothing more than force managers to generate and look critically at all the data the program requires, it would still help managers be more productive. The program, of course, does far more than that.

HPM's three main components include the Roadmap, Schedule, and Calendar functions. The Roadmap function automatically creates a project flowchart according to information you provide about the relationships between tasks and milestones. All flowcharts can be viewed on-screen or printed.

The Roadmap function is especially helpful in identifying heavy work periods. Because many tasks can have a common milestone, it is not unusual for a number of tasks to be going on concurrently. An advertising agent, for example, can have a great many tasks to perform before submitting a potential ad campaign to a client. HPM's Roadmap function reflects this reality by stacking several tasks on top of one another, all connected to the same milestone.

Anyone familiar with the complexities that can arise when trying to draw an all-inclusive flowchart of a project will appreciate HPM's ability to handle virtually any combination of tasks and milestones. In spite of my best efforts, I was unable to devise a combination that HPM didn't immediately and accurately display.

Pinpointing Delays

The Schedule function displays the timing of task and milestone information. That is, it illustrates graphically the start and end dates of each task and incorporates in that illustration the critical and slack times for each task. This scheduling information is displayed in the form of the familiar Gantt chart whose major function is to alert managers to potentially critical problems by pointing out those times when a delay in one task could cause a delay in the entire project. As with the Roadmap function, all charts are created automatically from the information you supply.

Finally, the Calendar function allows you to define the number of work hours per day, the number of work days per week, the beginning and ending dates of a calendar period, and holidays. When you select this function, the program produces two rows each containing three months' worth of calendars. After you've customized the calendars, you can use them in conjunction with the other components of the program

---

George F. Goley IV is associate product planning analyst at Datapro Research Corp. and president of Micro Endeavors Inc., a Willingboro, New Jersey-based microcomputing consulting and programming firm that specializes in dBASE II.

whenever you're dealing with work time.

Real-Time Interaction

One of the major strengths of HPM is that the Roadmap, Schedule, and Calendar functions interact in real time. For example, if while in the Roadmap function, you add a new task or milestone, that task or milestone will appear in the Schedule function in its appropriate place and with an appropriate chart. Likewise, if you change the work week while in the Calendar function, the program will reflect that change in the slack and critical times in the Schedule function. In addition to updating all the various functions simultaneously, HPM updates a status line that contains cost and time summaries for the project.

Another one of the program's strong points is that you can see all of these updates take place at the same time. HPM lets you use a window function to divide the screen into three sections, each containing a different function. Although the windows are for display only—you must access the appropriate menu to use each function—they are extremely helpful in determining the overall effect of an action on a project. They are especially useful during "what if" sessions when managers need to make strategy decisions based on different conditions.

How Do I Talk to HPM?

HPM is menu-driven: you make selections by typing the first letter of a command or by moving the cursor to a command and pressing Return. Conveniently, you can type the first letters of several commands in a row and HPM will execute them in order, without forcing you to wait for the appropriate menu to appear.

I found the rest of the commands to enter data or commands very cumbersome, however. Simple tasks require complex command sequences. For example, many fields must first be "blanked out" by using the backspace key before data can be entered. Other keystroke commands include a space bar to move between subfields like the month, day, and year sections of the date field; that same space bar to move between menu options; the arrow keys only to move around the screen in the Roadmap or Calendar functions (data is not entered with the arrow keys); the tab key to move from field to field (on the IBM the tab key is labeled with two arrows, an unshifted tab moves you forward one field, a shifted tab moves you back one field); the return key to exit the project or "node" (a node refers to either a task or milestone) and save the results; the ESC key to undo the last command. These commands are different from the normal commands for data entry in other software. Even when I became more familiar with the sequences I found myself making mistakes after 10 or more hours of practice.

Harvard Project Manager is not very forgiving of errors. In one instance when using the Schedule function, I entered an incorrect start date for a task and instead of receiving an error message I got a screenful of gibberish. I had to call the company's help line to figure out what had gone wrong. In the company's favor, I must say that every call I made to Harvard Software Inc. was answered quickly and efficiently by whoever was available.

Documentation

The interactive tutorial that comes with the system is fast-paced, thorough, and effective. You can get online assistance by pushing the F1 key on the IBM. Another, more convenient, way to use the facility, is to place the help function in a window and let it run as you work. This gives you a ready description of many of your options and doesn't slow the program noticeably. For some reason, this very important feature is not discussed until section 13-7 of the documentation.

The documentation is a problem and almost negates the positive effect of the other three forms of support. The first section of the documentation is really a workbook for the on-line tutorial and as such serves its purpose. The index is thorough and easy to use. The graphic design of the documentation incorporates lots of white space and colors to highlight commands and sections. However, the documentation contains a scant 16 pages of "reference" material. The reference section is the one you turn to when you forget what you learned in the tutorial two weeks ago and when you don't have the time or desire to sit through the tutorial again. A reference section of only 16 pages is inadequate for software this good and this sophisticated, and documentation of this sort can prove to be a significant problem.

For example, one of HPM's most powerful features is its ability to treat any predefined project as a subproject. That is, you can define a full project as a task in another project, thereby breaking large projects down into more manageable ones. This excellent feature allows for very accurate estimating because a task can be dealt with in small units. The documentation never mentions the procedure for implementing this feature. The procedure is covered in the tutorial but not in the documentation. A Harvard Software spokesperson said that they are aware of the manual's shortcom-

At a Glance

Name: Harvard Project Manager

Type
Project management tool

Manufacturer
Harvard Software Inc.
521 Great Rd.
Littleton, MA 01460
(617) 486-8431

Price
$395

Format
5¼-inch floppy disk

Computer
IBM Personal Computer, XT, and compatibles

Documentation
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Audience
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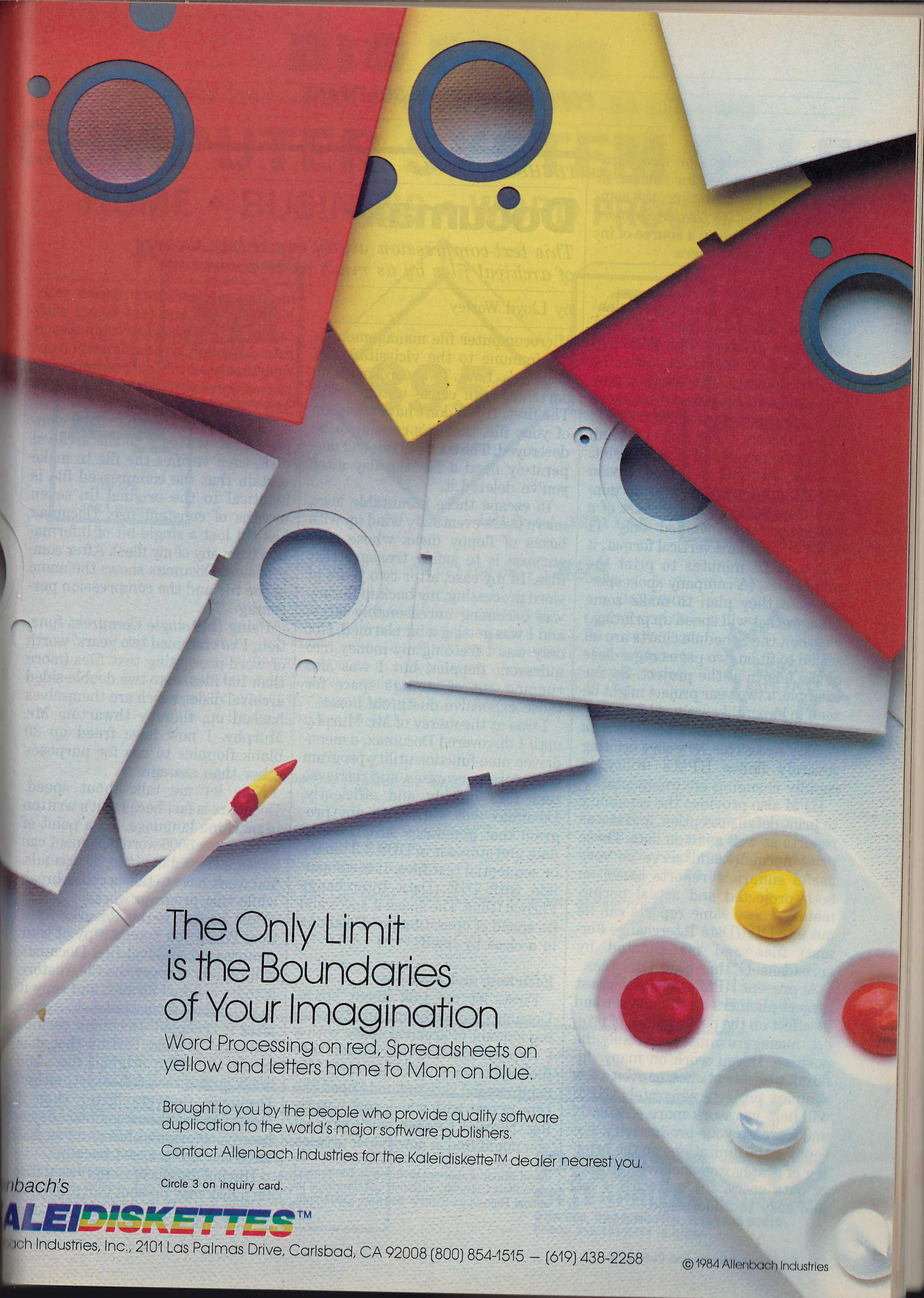

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ings and are working on new documentation scheduled for release in early fall. In the meantime, the company hopes that its *Dealer Support Manual* will serve as a source of information for end users.

Printing Graphs

HPM can print Roadmap, Calendar, and Schedule charts on most dot-matrix printers. The Roadmap and Schedule charts can even be printed sideways. This allows a very long chart to be printed on more than one sheet of continuous paper. Unfortunately, these charts take an inordinate amount of time to print. It took an IBM XT and Epson MX-100 dot-matrix printer 25 minutes to print a two-page chart of a Roadmap that included only 11 tasks. In standard vertical format, it still took 25 minutes to print the same chart. (A company spokesperson said they plan to make some changes that will speed up printing.) Further, the Schedule charts are all scaled to fit on two pages regardless of the length of the project. So, for example, a two-year project might be seen in bimonthly scale, while a two-month project would be shown in weekly scale. This very slow printing severely limits HPM's utility in rapidly changing environments.

HPM also provides the capability to print detail, exception, and status reports as well as to-do lists. These print normally and serve as very useful summary reports based on both projected and actual performance. These same reports can be put into DIF (Data Interchange Format) files and manipulated by spreadsheets that read DIF files.

At present HPM is one of the best project planners on the market and its effect on the performance of project managers must inevitably be positive. If you work on many different projects at once, or even a few complex projects separately, HPM will help you work more efficiently and increase your productivity. Except for the limitations on the printing of graphs and the awkwardness of data entry, the software is fast and easy to understand. □

TECHNICAL TOOLS

Documax

This text-compression utility can reduce the size of archival files by as much as 50 percent

by Lloyd Worley

Microcomputer file management is not immune to the vicissitudes of Murphy's Law. Two corollaries in particular can cause untold grief. The first: If you don't have a backup of your file, then it's certain to be destroyed. The second: You will desperately need a file the day after you've deleted it.

To escape these immutable laws, micro users eventually wind up with boxes of floppy disks whose only purpose is to safely treasure text files. In my case, after two years of word processing, my backup library was becoming unreasonably large, and I was getting a bit alarmed. Not only was I freezing my money into quiescent floppies, but I was also running out of storage space for those expensive dustproof boxes.

I was at the mercy of Mr. Murphy until I discovered Documax, a menu-driven nine-function utility program that stores, organizes, and retrieves text files quickly and efficiently. Documax will work with any program that generates ASCII-coded data and stores it in DOS 3.3 binary or sequential text files. It is compatible with DIF (Data Interchange Format) files. The space it saves and its speed of operation put Documax in a class by itself.

Efficient and Fast

First, let me talk about space. Documax has saved me an astonishing amount of archival space with a Compress function that shrinks text files by as much as 50 percent. The compression rate depends upon the type of text with which you're working. Normal English, such as what you might find in newspaper articles, has the highest compression rate. Numeric text and text heavy with capital letters has a low compression rate. Although, a reconfiguration option that you can access improves the compression rate for numbers and capital letters.

Documax reads the file, compresses it, writes it to the archival disk, then verifies the file to make certain that the compressed file is identical to the original (in seven months of constant use, Documax has not lost a single bit of information from any of my files). After compression, Documax shows the name of the file and the compression percentage.

Using this single Compress function, I've crammed two years' worth of word-processing text files (more than 100 files) onto two double-sided archival disks, which are themselves backed up, thereby thwarting Mr. Murphy. I now have freed up 30 blank floppies to use for purposes other than storage.

Now let me talk about speed. Documax is fast because it's written in machine language. As a point of reference, a 5000-word document can be compressed in about 30 seconds. You won't have to take a coffee break while this program works.

Just as fast is the Recover function. When you need a copy of your compressed archival file, Documax will rapidly recover the file, restore it to its original format, and copy it to a standard formatted disk. Again, after it is copied, Documax verifies the copy to make certain that it is identical to the original file. And don't go for that coffee yet, either. Documax recovers faster than it compresses. When it is finished, you have your original file and you still have the compressed backup.

Having dozens of compressed files on a disk may present two problems:

Lloyd Worley is assistant professor at The Pennsylvania State University at Dubois and Director of the annual Penn State Strictly Software Conference.

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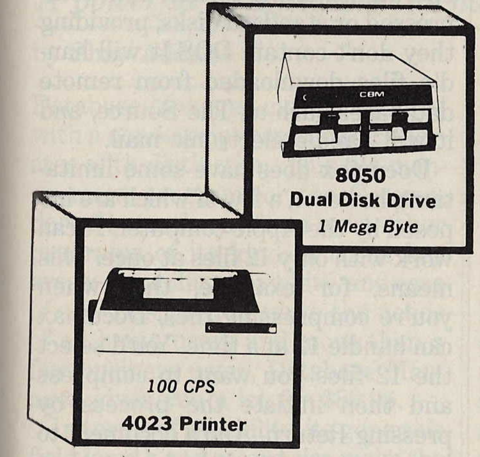

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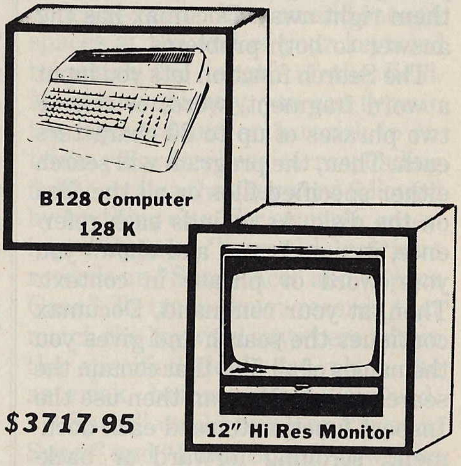

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First, you might run into trouble finding specific files, especially if they're old ones whose names or contents you can't quite remember. Second, once you've located the files you'll probably want to skim through them right away. Documax has the answer to both problems.

The Search function lets you input a word fragment, word, or one or two phrases of up to 30 characters each. Then, the program will search either specified files or all the files on the disk. As it finds each reference, it signals you and shows you your word or phrase in context. Then, at your command, Documax continues the search and gives you the names of all files that contain the search words. You can then use the Inspect function to read each document, scrolling forward or backward. You can also print the entire document or segments of it.

Once again, forget going for coffee: Documax's Search function speeds along. Recently, for example, I needed to locate among my 100 compressed files a long bibliography. In true professorial manner, I had forgotten its text-file name, but I knew that the word "Rosicrucian" appeared in it. So I instructed Documax to perform a disk search, that is, scan all the files on the disk, for "Rosicrucian." About halfway through the disk, Documax signaled that it had found the key word. In 10 seconds, I had my bibliography, and in less than a minute I had read it and printed out the segment I needed. That's the kind of speed and ease of use that I expect from a well-written program.

The Documax designers have headed off another potential problem: locating files whose names you know. The program's Sort function quickly alphabetizes your file directory. This means that you can easily find any one file without scanning an entire compressed-file directory, which could include as many as 50 files on one side of a disk. In addition to regular alphabetizing, Documax can form subgroups of up to 10 alphabetized groups of files. Thus, you could group together the various drafts of a manuscript, or organize related files, and, in so doing, eliminate having to search through the whole directory for related files.

More Speed and Efficiency

The remaining four functions, Transfer (copy files), Delete, Rename, and Directory, also operate quickly and efficiently. Transfer moves compressed files from one disk to another. As a safety feature, the Transfer mode notes duplicate file names and gives you the options of skipping the transfer, transferring with a different name, or transferring to the same name. Delete also has a safeguard that requires you to confirm each deletion before it is carried out. With Rename, you can rename a file or name a disk and assign it a volume number. The Directory function shows your entire file directory, amount of free space, and the number of files currently on a disk. You can scroll through the directory or print all or part of it. In fact, you can order Documax to print anything that is showing on the screen no matter what function you're using.

At a Glance

Name: Documax

Type
Text-compression utility

Manufacturer
Signum Microsystems
120 Mountain Ave.
Bloomfield, CT 06002
(800) 642-7611; Connecticut residents dial (203) 726-1911

Price
$99.95; demonstration disk available at $10, applied against the cost of the program

Format
5¼-inch floppy disk with backup copy

Computer
Apple II, IIe, IIc, and III in emulation mode; requires one disk drive but two disk drives speed all operations; ProDOS and MS-DOS versions scheduled for release in early and late fall, respectively; Macintosh version due in January 1985

Documentation
Clearly written manual

Audience
Micro users who back up their text files

Other Operations

Documax also performs other operations. It will format both compressed or standard disks, providing they don't contain DOS.It will handle files downloaded from remote databases such as The Source, and it will handle electronic mail.

Documax does have some limitations, however, a few of which are imposed by the Apple computer. It can work with only 12 files at once. This means, for example, that when you're compressing files, Documax can handle 12 at a time. You'd select the 12 files you want to compress and then initiate the process by pressing Return. And a document to be compressed can't be longer than about 6000 words. Also, Documax can't handle text files in which the data is stored randomly. These limitations are minor, however. If Documax lacks anything, it lacks an Undelete mode, to give you a second chance just in case you "confirm" a deletion you really don't want. I've done that, and it didn't make me very happy.

Overall, the Documax package is slick and professional and very easy to use. You won't find yourself resorting to guesswork of any kind. You hardly need to read the documentation to get started. However, I would encourage you to read the manual simply because it's a pleasure to see clear and humane instructions married to clear and crisp illustrations. And the Quick Guide will refresh your memory as you're working with the program.

Nothing cheap or slipshod mars Documax. It will work with any word processor that writes in standard text files, it will work with any binary file, and it will convert between the two.

Documax saved me both time and money from the first day I used it, something that no other file management software or utility program has done for me so far. Mr. Murphy may not like Documax, but micro users will. □

BUSINESS

Database Manager

A powerful and flexible file handler for the Commodore 64

by Shay Addams

Database Manager may be saddled with a nondescript name, but it operates with distinction. This file management program for the Commodore 64 stands out from most other programs of its kind in three key areas: capability, flexibility, and ease of use. Designed to serve the needs of all home users and more than a few business users, Database Manager gives you a lot for $89.95.

In terms of capability, its generous field length and record size make the program suitable for a variety of applications. Calculated fields add power, and convenient update options don't lock you into the form as you originally designed it. Searching and sorting functions combined with conditional statements give you the flexibility to link together information in different records. And onscreen menus and a general overall logical design make Database Manager a user-friendly program.

Before I get to the specifics of the way this program operates, I'll take just a few lines to reiterate the familiar database model. Think of an index card file. The entire box is the file, or database. Each individual index card is analogous to a record, and each item written on an index card, such as name, address, and telephone number, is analogous to a field.

Getting started is easy. After you boot the disk, the program loads automatically. At this point, the main menu is displayed in the top third of the screen. Each of the eight options on the main menu has its own submenu of options. And the menu that represents the option you're working with remains onscreen at all times. While this contributes to the program's ease of use by eliminating the need to memorize functions, it also takes up a good portion of screen space, forcing you to scroll up and down to view all of a lengthy record. Trade-offs are the name of the game.

Form Generation

Creating forms, which you fill in later as individual records, is virtually hassle free. To define a field you simply type in the name of the field and, using the F1 key, score a line across the screen until you've given yourself enough space to hold all the information needed for that field. Generating fields this way gives you a clear picture of what the completed form will look like. You can rearrange the layout and redo field lengths until you have what you want.

A field can contain up to 250 characters. A record can contain up to 200 fields for a total of 2500 characters, including field names. A single disk can accommodate a database of about 150,000 characters. The number of records in each database depends on the size of each record.

Filling out the forms to create individual records is as easy as defining the form. From the main menu, you select Append File and a blank form appears on screen. Now you simply fill in the blank lines representing each field. Hit F5 when the record is complete, and it's automatically saved on disk. When you quit the program, it automatically saves all current data on disk, eliminating the possibility of your losing all your hard work by forgetting to save the data manually.

Searching

You can browse through your database and review or edit a file one record at a time. Or you can search for specific records by moving the cursor to the field you want to match, then pressing F5. You type in a keyword or phrase and the program quickly consults its index and extracts the next matching record.

You can search for matches in a specific field in three ways. The most obvious is to look for exact matches, which requires that you add enough spaces at the end of your keyword to match the length of the field. More conveniently, you can type in the keyword and an asterisk to retrieve records whose corresponding field contains that keyword followed by anything else. For example, entering "Space * " would retrieve records on "Space Ace" and "Space Case." To track down records that match the keyword anywhere within the specified field, you place the asterisk before your keyword. " * Space" would bring up "Lost in Space" and "Inner Space" as well as the above responses.

These search methods suffice for most purposes, but if your task calls for more complex field matching, you'll want to use the conditional searches. Database Manager's strongest feature, conditional searches can dig up records with matches in one or more fields. When performing a conditional search, you refer to different fields by their string array variable: the first field is f$(1), the second, f$(2), and so on. With conditional statements based on a single field, all you have to do is move the cursor to the proper field and press F5. The corresponding string variable appears on-screen and you type in the conditional statement, which can be up to 80 characters long. With this statement length, you can conduct some extremely data-specific searches. For example, business users can retrieve information telling them which customers have owed more than a certain balance for longer than three months. The better your BASIC, the more you'll be able to wring out of conditional statements, but even novices can pick up the essentials after a short time at the keyboard.

Calculated Fields

Anyone with business on the brain will appreciate the inclusion of cal-

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Shay Addams is a freelance writer who lives in New York City.

culated fields in Database Manager's arsenal of capabilities. This function facilitates the automatic calculation of numbers entered in certain fields. You can, for example, "program" the figures in several fields to be added together and the sum multiplied by another number (representing tax or commission, perhaps), then have the results of these calculations rounded off to two digits and stored in the final calculated field. The entire process is initiated during form creation. You type in a formula that's composed of the BASIC symbols for addition, multiplication, and other mathematical operations. Formulas can contain up to 50 characters. As in the case of conditional searches, this feature uses variable names, so at least a slight acquaintance with BASIC is necessary to get the most from calculated fields.

Sorting

No such BASIC know-how is needed for rapid file sorting, which is recommended for speeding up searches that are based on the same field. From the main menu, you press a single key to enter sort mode and choose one of three types: create a sort on a specific field, recall a previously saved sort, or prepare a multiple sort. In the first, you move the cursor to the chosen field, hit a function key, and the records are sorted in alphabetical order. The program then creates a sort index, which is a file independent of your database that instructs the program how to order the records in the database. You can save the sort index on disk and then return to the main menu. The file can now be displayed, searched, or printed in alphabetical order of the data in the field that was sorted.

While you're using a sort index, all new records are automatically entered in alphabetical order. The only drawback is that the program does not update any sort indexes that are saved on disk. Only the index that's currently in RAM reflects the modification you've made to the file.

Multiple sorts involve sorting first through one field, then another; within the same index, your records can be sorted as many times as there are different fields. One practical application is to sort a file by the zip code field, then by the name field. Upon reviewing the file, you'd see records for everyone in zip code 10017 displayed in alphabetical order, then the same for names in 10018, followed by other zip code areas.

Printing Options

Multiple sorts involving zip codes can be useful when printing mailing labels from addresses that are part of larger records. But there are certain limitations: a maximum of 32 characters per field and only four lines per label. The labels are printed in a single column, one under the other.

Three other methods of printing are available: form, list, and report. Form prints the entire file exactly as it appears on-screen, one record after another. List allows you to choose information from as many fields as you desire, printing the information horizontally across the page in any order. The report generator will print titles at the top of each page, format pages, do automatic numbering, and let you preset the number of digits on the right side of a decimal point. It does not allow you to send codes to the printer to engage underlining and other fancy printing features. Database Manager is noticeably missing the ability to dump whatever's currently on the screen to the printer.

At a Glance

Name: Database Manager

Type
File management program

Publisher
Mirage Concepts Inc.
2519 West Shaw #106
Fresno, CA 93711
(209) 227-8369

Price
$89.95 (backup copy, $7)

Format
5¼-inch floppy disk

Computer
Commodore 64

Option
Advanced Report Generator, $49.95

Documentation
Vinyl-bound loose-leaf manual with tutorial

Audience
Business and professional users and home users requiring large files that are flexible and easy to manipulate

The company's Advanced Report Generator, which is available as an option for $49.95, gives you greater control in producing customized reports. Although I didn't use the Advanced Report Generator and, therefore, can't evaluate its features, the company says it eliminates the restrictions inherent in Database Manager on formatting and producing hard copy. This option supports, among other features, additional calculation and sorting abilities, printer commands, and columnar reports and form reports.

Handy Features

In addition to standard options such as formatting disks, deleting files, and reading the disk directory, several other useful features are accessed from the File Command menu. Because disk space is always at a premium, it's very useful to be able to "pack" the files on a disk to free up space occupied by deleted records. Also, you can convert any ISAM (indexed sequential access method) file into a sequential file readable by most word processors (mine worked with Muse's SuperText and Commodore's Easy Script). A subfile of records can be compiled and saved under a different name; a conditional search makes selecting the records to fill the subfile a simple matter.

There's also a way to replace the information in a specific field on all records in the file in one operation instead of updating one record at a time. You can also restructure all file records to add a new field. When you've spent six months building up a file and suddenly realize the need for an unanticipated field, this feature can be a real life saver. Instead

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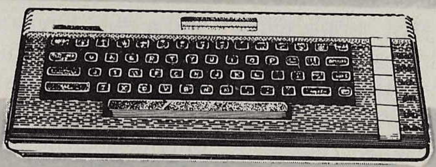

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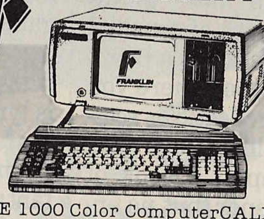

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of having to retype the entire file to update every record, you simply create a new form with the extra field. Then you are able to merge all the data from the original file into the new one.

One slightly annoying problem with this program is that because it uses ISAM-based files, you can't make backup copies by loading the file into RAM and then saving it onto a different disk. You must either have two disk drives or use a single-disk copy program that comes with Commodore disk drives.

Other than the limitations on making backup copies of your files and the printing restrictions, Database Manager is a fast and flexible file manager. It's a very powerful program for its price. And you'll be delighted at the clear and concise documentation, whose abundance of illustrations and examples makes Database Manager a perfectly suitable system for first-time users. □

GAMES

Completing the Zork Trilogy

Zork II and Zork III carry on the challenge and the adventure in this popular series

by Monte Schulz

When Infocom released Zork: The Great Underground Empire back in 1981, it shot adventure games into a new era. Because the game understood full sentences, differentiated between similar objects, and added an engaging story line to the traditional treasure-hunt adventure, Zork I redefined the genre. It became a classic in its own right and is still Infocom's best-seller.

Zork II: The Wizard of Frobozz, begins where Zork I left off—inside "an ancient barrow hidden deep within a dark forest." At your feet lie an old lantern and a sword of "elvish workmanship." The only path leads south across a rickety wooden footbridge into the phosphorescent light of a huge cavern. Lacking any real options at this point, you pick up the sword, light the lamp, and set out on the path.

Soon you're wading through the cold waters of a shallow ford and heading into a dark tunnel. You follow a path along the edge of a stream and then pass through a ruined archway into the middle of an extraordinary garden. Huge green hedges rise almost to the top of the cavern walls, where moss glows with a dull light. A path of crushed white stones leads north to a beautiful rose-draped gazebo, where you find an odd collection of articles scattered about on a table: a place mat, an empty china teapot, a book of matches, a letter opener (but no envelope), and a newspaper (*U.S. News and Dungeon Report*) that speaks of a "world-famous and battle-hardened adventurer [you?] seen in the vicinity of the Great Underground Empire. Local grues are reported sharpening their fangs." When you ask about the grues, the answer that comes up on the screen is enough to make you check your lamp and tighten your grip on the sword. Just then a strange little man in a black cloak and pointed hat materializes in the gazebo. He mumbles something through a stringy beard and disappears.

After gathering up everything from the table, you step outside and immediately spot a large white animal hiding behind a hedge. You rub your eyes in disbelief, but the image remains: a unicorn with a red satin ribbon wound about its neck and a gold key suspended from the ribbon. Assuming (perhaps presumptuously) that the key is somehow meant for you, you reach for it only to see the unicorn bound lightly away. You head off toward the south garden, whose hedges are clipped in the shapes of strange creatures. Now that's peculiar—the bushes seemed to change position. Perhaps it isn't safe here. A faint whirring sound emanates from a tunnel to the west. Following it into a room whose high ceiling is invisible in the gloom, you begin to feel vaguely disoriented and turn to leave. Walking east again to the topiary garden, something goes wrong. It appears you have ended up in another place entirely.

Where Am I?

Ten minutes into Zork II: The Wizard of Frobozz, you have discovered one clear fact: orientation to your surroundings is not something that comes easily. You have also found that this is an extraordinary game program. Despite its fantasy context, the game's sense of realism is amazing. Life and color abound. It is lyrical and funny, with a character that seems rooted in everything from Victorian literature and pulp fantasy to science fiction, Greek mythology, and the Arabian Nights. Besides the unicorn and the Wizard of Frobozz himself (materializing every so often out of thin air to cast spells on you, invariably at the worst possible moments), you encounter glaciers and dragons, crystal balls and magic wands, hollowed-out volcanoes, libraries, banks, epicene gnomes moving at will through solid stone, sea serpents, three-headed dogs, hot-air balloons, pearl necklaces, even a beautiful princess longing to be rescued. You are asked at one point to answer a child's riddle:

> What is tall as a house,
> Round as a cup,
> And all the king's horses
> Can't draw it up?

Should you solve the riddle, however, you will only be led deeper into the caverns, seemingly to a dead end in

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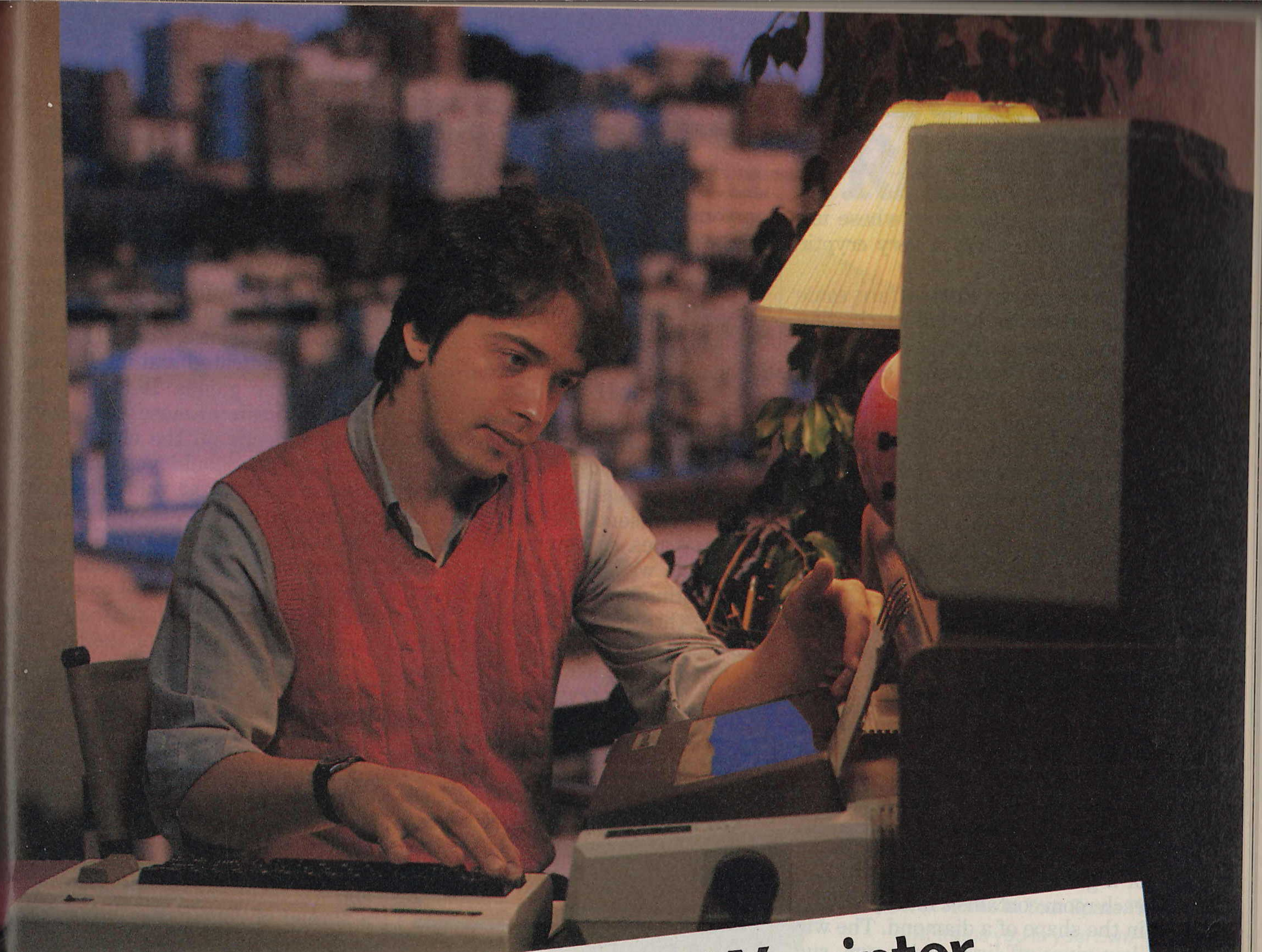
Monte Schulz is a freelance writer who lives in Santa Barbara, California.



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a strange circular room whose unscalable walls carry a very cryptic message.

The puzzles in Zork II are some of the most creative and fascinating a game player is likely to find in any adventure. Beautifully conceived and written, they appear to the novice virtually impossible to unravel. The trick to the puzzles is that they present rational problems in an irrational universe, which is to say, the heart of the puzzles is rooted in the real world even though the setting in which they appear most definitely is not. Generally, obvious clues lead to solutions that are not overly obscure.

Orderly thinking is the key to solving Zork II's puzzles. You must get an idea of the scenario in its many diffuse parts before trying to tackle it as a whole. In the peculiar maze of Oddly-Angled Rooms, for example, you search a series of look-alike rooms whose walls are constructed of a glassy substance. The floor of each room contains a murky window in the shape of a diamond. The window gives off light of its own, suggesting perhaps a lighted room below. Walk about from room to room and the light changes as you move, alternating in intensity and sometimes even going completely dark. Wander long enough in the maze and the disembodied voice of the Wizard taunts you in your helplessness: "Fool, you'll never get past first base at this rate!"

Typical of the puzzles in this game, you not only have a hard time solving the problem but most of the time you haven't a clue as to what the problem is. What, after all, is the Oddly-Angled Room, and what is it for? Once you figure it out, though, it is like most puzzles in the game—almost embarrassingly simple.

While Zork II is definitely one of the most difficult games you are likely to play, it is so colorful and has so many interesting puzzles and characters that the time spent working on it never seems wasted. Instead, scenes and problems from the game will remain with you wherever you are, never quite releasing their hold on your imagination. Many players might never finish Zork II, but certainly very few will be disappointed by it. For those clever and fortunate enough to reach the end, yet another challenge remains.

Beyond Zork II

The final part of the trilogy is Zork III: The Dungeon Master. The Great Underground Empire has been reduced to ruins empty of all but the lurking presence of hundreds of deadly grues. As you wander about the stone walls on the rocky cliffs overlooking the mighty Flathead Ocean, through the rolling mists in the Land of Shadow, and along the archways of a once great aqueduct, you're basically trying to divine the reason for your presence there. Zork III is the ultimate test for adventurers. Just as Zork II went beyond the treasure-hunting focus of Zork I, this game takes the story beyond simple puzzle solving and asks that you develop a genuine sensitivity to plot. Until you realize why you are supposed to be doing there, you will not be able to confront the legendary Dungeon Master and finish the game. In this sense, Zork III is the most sophisticated and intellectual of the three games. It is also the most difficult, because the entire game depends on the choices you must make. Should you take the wooden staff or the valuables from the man on the cliff? Should you kill the hooded figure in the Land of Shadow or try to escape? Should you break the mirror in the Long Hallway? Is the proper exit for the Royal Puzzle the steel door or the hole in the ceiling?

At a Glance

Name: Zork II: The Wizard of Frobozz; Zork III: The Dungeon Master

Type
Home entertainment

Manufacturer
Infocom Inc.
55 Wheeler St.
Cambridge, MA 02138
(617) 492-1031

Price
$49.95 each; $59.95 for CP/M and NEC Advanced Personal Computer versions

Format
5¼- or 8-inch floppy disk

Computer
Apple II, Atari 400/800, DEC Rainbow, IBM Personal Computer, NEC PC-8000 and Advanced Personal Computer, TRS-80 Models I and III, Commodore 64, Osborne 1, TI Professional, and any CP/M-based system with 8-inch disk drive; requires 32K bytes of random-access memory (RAM) and one disk drive

Documentation
Game manual and reference card

Audience
Adventure game enthusiasts

In at least a dozen instances in Zork III, the resolution of a problem involves making quick and irrevocable decisions whose consequences are often not readily apparent until quite late in the game. Even the scoring system is of little help—it's fairly simple to have a perfect score and still be in a no-win situation. Yet a thread of consistency unites the problems, and it lies in the special attitude the game requires you to adopt. If you find this thread, you will have a better than even chance of solving the entire game. But ignore the connection one puzzle has with another and you will lose again and again.

Zork III reverses the traditional approach to adventuring by discouraging the arrogant looting of the underground. Go berserk here and you will never finish the game. Instead, patience is probably the most helpful attribute when confronting the Royal Puzzle buried deep beneath the marble floors of Lord Dimwit Flathead's Great Museum. This puzzle is the most complex, difficult, and sophisticated challenge in all of Zork. It is both an architectural masterpiece and a model of simplicity, being in concept hardly more than one of those puzzles whose object is to slide numerals around in a little square to restore them to their proper order. But in the Royal Puzzle, you cannot see the open passageways or know without mapping how

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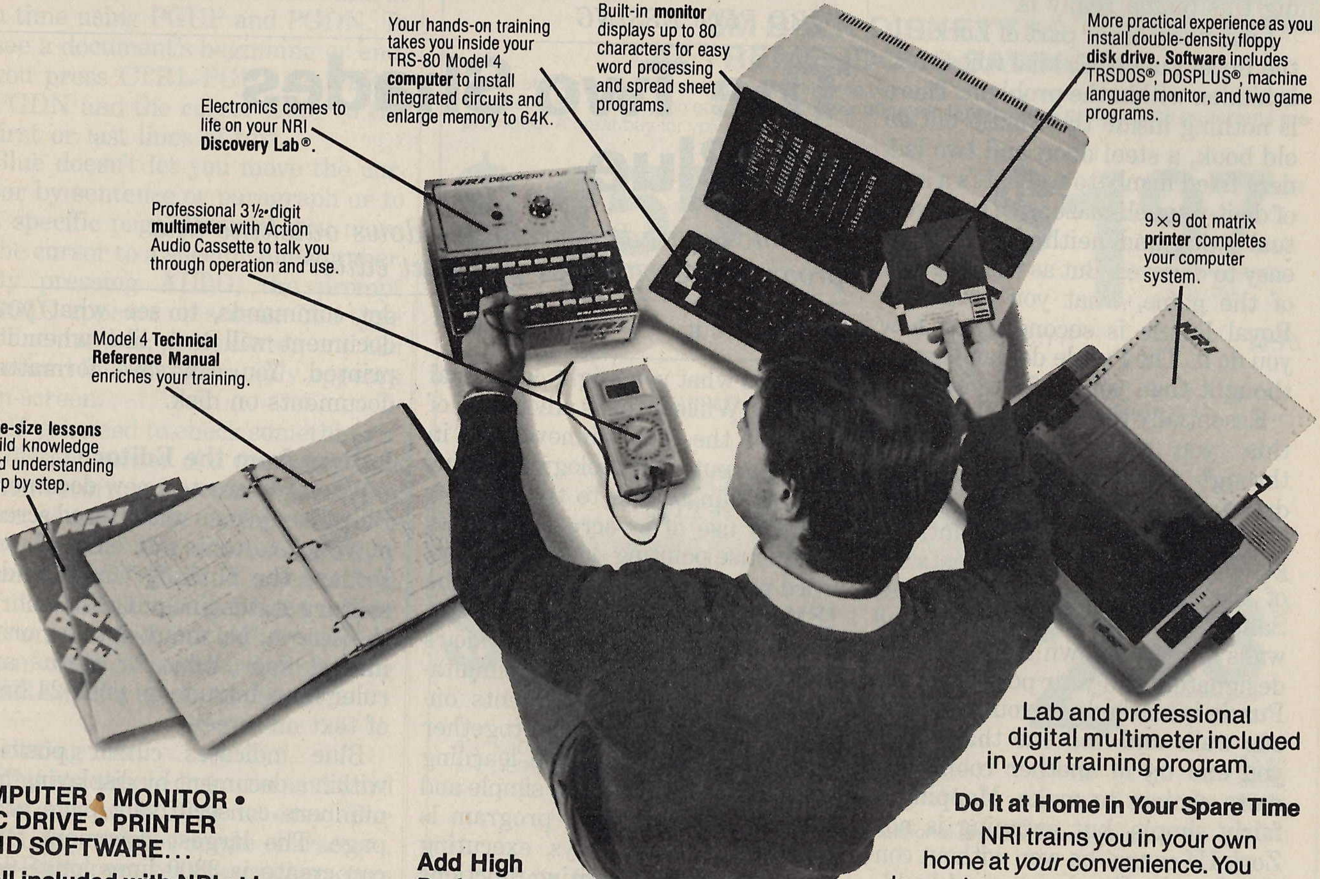
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big this puzzle really is.

Like every other part of Zork III, the Royal Puzzle is a trial whose test is hidden within the problem. There is nothing inside the Puzzle but an old book, a steel door, and two ladders fixed firmly to walls. It's a kind of do-it-yourself maze with two eventual exits, and neither of them is easy to discover. But as with the rest of the game, what you do in the Royal Puzzle is secondary to how you do it. The Puzzle demands more thought than you at first realize.

Essentially the Puzzle works like this: you enter the first room through a hole in the ceiling and drop to the ground. Lacking an exit, you push a wall. At this point, the game gives a graphic representation of the architecture of the Puzzle. Sandstone walls, marble walls, and walls of an unknown substance are designated, and your position in the Puzzle is marked. As you push various walls and find one that yields, you end up in another room with more choices to make. Mapping is fairly simple, but escaping is not. Zork III cannot be won without conquering the Puzzle, so good luck!

Those who penetrate the Royal Puzzle will eventually find their way to the heart of the Dungeon and the Treasury of Zork. Your discovery of vast wealth and power will be secondary to the feeling of genuine accomplishment at having completed a beautifully written and cleverly constructed adventure.

Though any one of the three Zork games can be played without knowledge of the other two, those adventurers who travel the full distance from the open field west of the small white house in the first Zork to the Treasury in Zork III will enjoy a sense of continuity that creates an even greater feeling of accomplishment. Like their predecessor, Zork II: The Wizard of Frobozz and Zork III: The Dungeon Master represent absolutely the best adventure games you'll find in today's market. They are challenging without being obscure and endlessly entertaining. In short, Infocom has given us an adventure trilogy without peer. □

WORD PROCESSING

The Two Shades of Blue

The mouse and multiple windows outshine this program's capabilites as a text editor

by Bill Grout

Blue has what you might call a dual identity. While it takes advantage of some of the latest innovations in microcomputer technology, it retains an unfortunate link to the past.

Blue's use of on-screen windows and mouse pointing device puts this word-processing program for the IBM Personal Computer in the vanguard. It can define eight windows at once, allowing you to simultaneously view nine documents on-screen. And the mouse together with pop-up menus make learning control-key combinations simple and fun. Yet although this program is powerful in many ways, executing some fairly simple editing functions can become awkward. Making block moves, for example, requires some electronic acrobatics. Let's take a look at the program.

Blue is actually two programs: Blue Editor and Blue Formatter. You use the Editor to create and edit word-processing documents and perform various file-handling functions such as viewing disk directories and saving documents on disk. During the writing and editing process, you must imbed print-formatting codes in text. Blue is not one of the "what-you-see-is-what-you-get" programs that shows you exactly on-screen what your printed document will look like. Blue will display on your monitor paragraph indentations, line spacing, and right- and left-margin justification, but it won't show such things as different type faces or other formatting options. You must run Blue Formatter, which displays your text as you've indicated via the dot commands, to see what your document will look like when it's printed. You can save formatted documents on disk.

Letters from the Editor

When you create a new document, Blue gives you an uncluttered screen on which to write and edit. All you see are the blinking cursor and a solitary status line at the bottom of the screen. No menu options, ornamental lines, icons, or status and ruler lines intrude on your 24 lines of text on-screen.

Blue indicates cursor position within a document by displaying line numbers consecutively page after page. The largest document Blue can create is 3300 lines long—64K bytes of user memory. Blue's cursor indicator does not start over at one when the cursor moves to a new page; the line numbers just keep climbing as the cursor moves toward a document's end. This type of cursor-position indicator becomes a problem with long documents. If you must move the cursor to page 30, how high a line number do you choose? You must do a little multiplication in your head or blindly jump the cursor to where you think you want to be.

Blue gives you the choice of editing using Insert or Replace modes. You can quickly move the cursor by character, word, line, or in larger leaps via the four arrow keys on the numeric keypad. HOME and END jump the cursor to the top or bottom of the screen or window. The cursor darts horizontally to the left or right screen edge when you press CTRL-HOME or CTRL-END respectively. You can also move the cursor to the right end of a line by typing

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Bill Grout writes software reviews for the *San Francisco Chronicle*.

CTRL E. Text scrolls a screenful at a time using PGUP and PGDN. To see a document's beginning or end, you press CTRL-PGUP or CTRL-PGDN and the cursor leaps to the first or last lines of text.

Blue doesn't let you move the cursor by sentence or paragraph or to a specific page. Instead, you move the cursor to a specific line number. By pressing ALT-G, the prompt GOTO appears on screen. You type a line number, press Enter, and the desired line of text rapidly appears on-screen.

If you need to check something in a distant corner of a document and then return to the same place, you can set a place marker, called a "bookmark." You set a bookmark by pressing CTRL-B. You can then cruise the cursor up or down your document and instantly home to your original position by pressing CTRL-G (for go to bookmark).

Deleting Text

Making simple character and word deletions with Blue is easy. The DEL key deletes single characters, the Backspace key erases characters as the cursor backs over them, and CTRL-Backspace deletes text by moving *forward* through the text. Blue also has an undo function that restores text to the screen if you accidentally delete too much.

Deleting larger amounts of text is disappointing, however. Blue can't delete a whole sentence, paragraph, or page at a time without first marking it as a block. You can block mark any number of lines for deletion. Unfortunately, text-block deletions are line oriented. This means you can't delete a portion of a line, but must delete all of it or nothing. This is awkward. Sentences often begin and end somewhere within a line. So you are forced to mark and delete from the second line to the penultimate line of the block in one chunk, then clean up any straggling words that are still left on the first and last lines. You can also tackle the problem by breaking out the block's beginning and ending lines as individual lines. Whatever procedure

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you use, Blue's block deletions call for needless extra work which other word processors avoid.

Moving and Copying

Like most word processors, Blue enables you to pick up a section of text and plunk it in a new position. You deposit the text to be moved or copied in a temporary holding pen (or buffer), called the "pickstack." You then transfer the text out of the pickstack into a new location.

Blue moves or copies text by word or line. If you want to change the location of several words, for example, you use word mode. With the cursor in front of a word to be moved, you press F4 which is called the "Cut" key. The word disappears as it is snatched from the text and stuffed into the pickstack. You press the Cut key once for each word you want to put in the pickstack.

You next position the cursor where the word or words are to appear and empty the pickstack by pressing F8. All the words you "cut" are inserted into the document. You can also empty the pickstack one word at a time by pressing F5, called the "Paste" key. Blue copies and moves entire lines at a time in the same manner.

But these copying and moving procedures are awkward for several reasons. First, if you want to copy seven words or seven lines, you must press the "Cut" key seven times. Copying 15 lines of text may give you the feeling of tapping out Morse code.

There is another way to copy or move lines but I found it an unsatisfactory alternative. You can automatically load the pickstack until it fills up by using what I call the "gobble" keys, SHIFT and F3. After positioning the cursor in front of the text to be copied or moved, you press SHIFT-F3 and the pickstack gobbles up as many lines as it can hold, about 44.

With the pickstack full, you move the cursor to a new site and press F8 to insert the pickstack's contents into the document. If the text block to be copied or moved is longer than the pickstack can hold, you make repeated trips, first filling the pickstack, then unloading it, to transfer the entire block.

The pickstack is not a very finely tuned tool. If it's filled with more text than you want to copy, you have a new problem. You must insert all the lines from the pickstack into the text then delete the extra ones. This requires you to perform the additional procedure of marking and deleting a block of text.

More Editing Functions

Blue's search and replace functions are speedy and effective. You can search forward or backward through text, search for words in either upper- or lowercase, and search and replace selectively.

Like a lot of other word processors, Blue doesn't let you search exclusively for whole words, other than by including spaces before and after the search string. For example, if you don't add the extra spaces you cannot search for the word "man" without the program finding words that contain those three letters, such as "many." Also, when conducting a search and replace, Blue does not adjust capitalization to the dictates of the sentence.

Blue provides a little keyboard abracadabra with a function called a keystroke macro (which is something different from the dot command macros used for formatting text while working in Blue Editor). During editing, you may sometimes find yourself performing the same sequence of editing commands and keystrokes repeatedly. Blue enables you to store a command sequence, called a macro, and use it whenever need arises. For example, if you can't stand to type a phrase like "Transcontinental Railroad" frequently in a letter, you might create a macro that inserts these words in the text for you. Then, by pressing two keys, you can save yourself a lot of keystrokes. Unfortunately, Blue puts only one keystroke macro at your command at a time, where several other word-processing programs allow as many macros as you wish.

Blue does not enable you to delete, copy, or move columns of text (that is, edit information stacked vertically instead of horizontally). For example, while editing three columns of numbers in a financial statement, you cannot mark and delete or move just the middle column; you must delete or move each number individually, a time-consuming editing task that word-processing programs equipped with column-editing functions let you avoid.

Working with the Mouse

Blue also scores some good points with its support of a mouse pointing device. Using Blue with a mouse simplifies learning many of the editing functions. If you press a button on the mouse, a match-box-size menu pops up on-screen. Examining the menu, you see a list of editing options for cursor movement, moving and copying text, marking blocks, search and replace functions, exiting the editor, and miscellaneous others. By selecting an option, other menu selections appear that enable you to perform the selected function in the text.

Using the mouse and pop-up menus, for example, you can mark text blocks and move them to different positions in a document without touching the keyboard. Therefore you aren't obliged to memorize the control-key combinations used to perform editing functions unless you wish to. Once an editing function is completed, the pop-up menu disappears leaving a full view of your text again. I found that using the mouse and pop-up menus was effective and enjoyable.

Window Hopping

Blue's multiple windows for viewing and editing documents enable you to carve up your screen into boxes and display and edit up to nine different documents at once or several parts of the same document at once.

If you want to compare page 5 and page 40 of a document, for example, you might load page 5 in a window half the size of the screen, put page 40 in a window filling the screen's other half, and compare the two sections of text. You can also copy and move text from one window to another and from one document to another, making Blue's windowing especially useful for copy and move procedures.

Blue's eight windows have preset sizes varying from a full-screen view of text to half-screen views splitting the screen vertically or horizontally. You can reshape the windows to the sizes you need. You access a window for editing by holding down the Control key and pressing the function key corresponding to the window number. The eight windows are identified by a number in each window's upper left corner and you can further differentiate windows using color, if you have a color monitor. As you switch from editing one window to another, the different windows appear and overlap each other. With the press of a function key, the window you select conveniently surfaces on-screen for editing. Blue's windows work well and are easy to use. They stand out as one of Blue's strongest features as a word processor.

Formatting

The final appearance of a printed document is determined by the format codes you imbed in the text. As you create a document you insert commands to determine its format and type specifications, such as double space and boldface.

One of Blue's strong formatting features is its ability to create custom dot commands. If, for example, you use a paragraph style with specific indentation, margins, and blank lines between paragraphs, you can define a dot command to create the paragraph style you want. Blue calls these custom dot commands macros (not to be confused with the keystroke macro) and your macros can include as many dot commands as you wish. Then, during editing, you imbed the custom dot command wherever needed instead of repeatedly typing a sequence of individual dot commands throughout a document.

Dot Commands

Blue's custom dot commands are extremely useful because you can use them in other documents. All you need do is create a document in which all your custom macros are defined. Then, at the beginning of each new document, you imbed a special dot command that reads the file holding your macro definitions. You can then use the defined custom dot commands in the new document without having to redefine them.

Blue has a good arsenal of dot commands that can save you editing time. Blue provides dot commands that automatically generate title pages, appendix headings, and chapter and section headings for long documents. If you imbed the chapter and section heading dot commands, Blue can use them to produce a document's table of contents. Other commands initiate special printing

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features such as boldfacing, underlining, super and subscripts, and font changes corresponding to the capabilities of the printer used.

Blue also provides a dot command that prints footnotes at the bottom of a page. You, however, must calculate whether the footnote text will fit on the page (some word processors calculate this for you). A series of dot commands enables you to create lists with each item automatically numbered. The list can even be two levels deep, with one level numbered with Arabic numbers and the second level with letters of the alphabet. You can add, delete, or rearrange the list's items during editing, and Blue numbers them correctly at printing time.

Blue does not provide commands for some of the fancier features found on some word processors. For example, no simple way exists to print two columns of text on a page. Blue cannot automatically create indexes or outlines for a document. No dot commands exist to format abstracts or copyright notices, although with Blue's macro function you might easily define custom dot commands to do these jobs. No simple means of creating graphics effects, such as drawing a box around a text, is available.

If you regularly create documents that contain columns of numbers, be aware that Blue does not provide a decimal tab function to automatically line up columns of numbers on screen. And where other programs use multiple-line headers and footers, Blue allows only a single line of repeating header or footer text printed at a page's top and bottom. Aside from these few shortcomings, Blue's formatting commands and macro capability make it a versatile and effective formatter.

Printing

Essentially the work is done once you've typed a document and fortified it with dot commands. As a last step, you load Blue Formatter to print or preview the formatted document. Blue Formatter also allows you to view a document on-screen without printing, a handy feature when you're unsure whether a sequence of imbedded dot commands is correct. The document will slowly scroll up on-screen showing the exact margins, headers and footers, line spacing and other elements of the finished document. You can also save the formatted document as a file on disk.

Viewing and printing documents with Blue is easy. Once you understand the printing options just described, you can quickly set up a document for printing. You can master using Blue Formatter in about five minutes.

Documentation

Blue's documentation is clearly written and easy to read. The manual is divided into two parts dealing with the editor and formatter programs. A 15-lesson tutorial teaches Blue's editing functions. During the tutorial lessons, you load a sample document and then you can experiment with the editing functions each lesson presents. The lessons themselves do not provide exercises to perform or screen illustrations; they merely present explanations of how to use the different editing functions. Following the editing lessons, a brief 34-page reference section lists Blue's editing functions and function-key assignments.

The second half of the manual addresses the Blue Formatter. Three tutorial lessons provide examples of creating documents using Blue's formatting codes. You are given examples of how to format a letter, technical document, and a book. The purpose of these lessons is to provide examples that you can imitate in your own documents. Again, no illustrations are used in the lessons. The Formatter reference section provides descriptions of Blue's dot commands listed in alphabetical order.

Also provided on disk is an on-screen tutorial in which you can read explanations of Blue's editing functions in one window and try them out in the other.

But the lack of an index for the documentation is a drawback; you must look up topics using the table of contents. Overall, Blue's reference materials are good and avoid the use of technical jargon.

Weighing the Features

You'll want to take a hard look at Blue before you buy. Its windowing capability and support of mouse pointing are attractive features that distinguish it from many other word-processing programs. Blue's implementation of these two features is a successful step toward making word-processing programs easier to use. But do large tail fins make a good car? Some of Blue's other editing procedures have kept to an outdated line orientation that requires extra work during editing—a carryover from the earlier days of program editors.

Altogether, however, I found Blue an average text editor with two impressive and outstanding features—windows and mouse. □

At a Glance

Name: Blue

Type
Word-processing program

Manufacturer
Symmetric Software Inc.
3812 East La Palma Ave.
Anaheim, CA 92807
(714) 630-8733

Price
$150 standard version; $195 mouse version

Format
5¼-inch floppy disk

Computers
IBM Personal Computer, XT and compatibles; either color or monochrome; supports use of Logitech, Optomouse, USI Mouse, or Mousesystems mouse pointing devices

Documentation
Two-part manual with tutorial lessons and reference sections; on-screen tutorial

Audience
Anyone who wants a word-processing program that supports use of a mouse and windows

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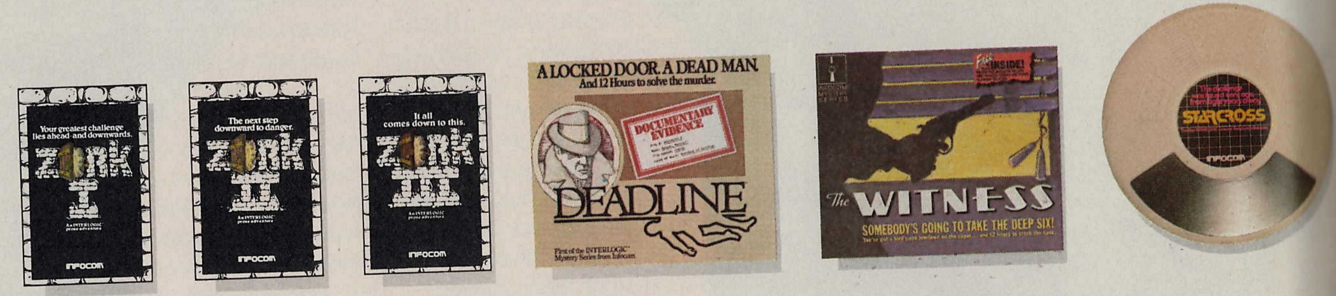
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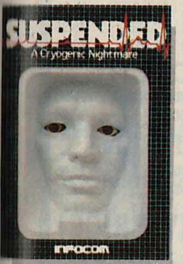

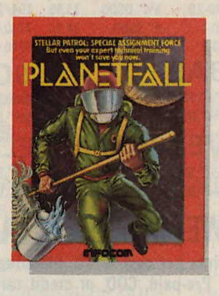
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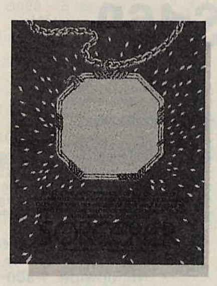

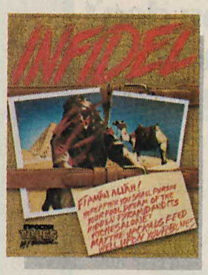

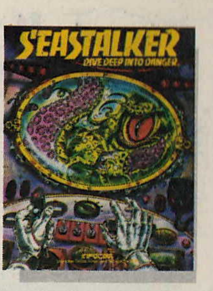

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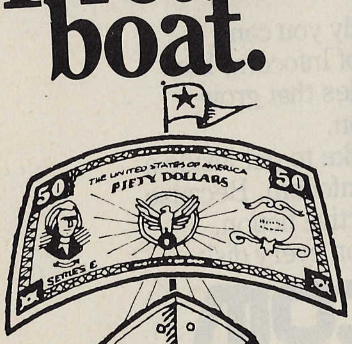

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NEW SOFTWARE

Business

A Clean Slate helps film and video professionals manage production costs. The system, based on the industry-standard AICP format, calculates budgets, creates bids, and tracks comparative costs. It can be easily modified to suit individual budget style and handles about 300 items. For the **IBM PC** and most **CP/M-based** systems; $795. Info.Cus Systems, POB 556, Middle Village, NY 11379.

Decision Aide, an information management tool, helps executive decision makers gather, organize, and analyze complex data. It also lets them formulate clear objectives, assess risks, and generate, evaluate, and rate alternatives. For the **IBM PC** and **XT** and **Apple IIe; $250.** Kepner-Tregoe Inc., POB 704, Princeton, NJ 08542.

Electric Desk integrates word processing, spreadsheet, database management, and communications. This multitasking program lets you work on several projects at once by interrupting one function while another continues. Its macro language lets you program keys to handle oft-repeated tasks. It also has windowing capabilities. For the **IBM PCjr** with 128K bytes of user memory and one disk drive, $295; and for the **IBM PC** and **XT** with 256K bytes of user memory; $345. Alpha Software Corp., 30 B St., Burlington, MA 01803.

Investment Analysis, a package of three programs, helps investors plan a market strategy. Included are a Fixed Income Security Evaluator, an Optional Strategy Evaluator, and a Commission Calculator that computes stock and option transaction commission charges. For the **Radio Shack Model 100** with at least 16K bytes of user memory; $69.95, cassette. Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.

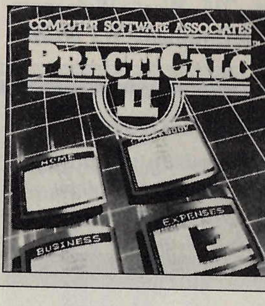
IOAS-3 integrates word-processing, database management, and electronic spreadsheet applications. The spreadsheet can automatically access totals of items in individual database records. Its word processor includes a full-screen text editor, word wraparound, and a file/merge feature. For the **IBM PC, XT,** and compatibles and the **PCjr;** $199. Micro Architect Inc., 6 Great Pine Ave., Burlington, MA 01803.

Life Insurance Planning helps you determine just how much life insurance protection you really need. The program considers such factors as inflation, your net worth, income, and living and college expenses. For the **Atari 400** and **800** and **Commodore 64;** $29.95. Atari version requires BASIC cartridge and 32K bytes of user memory. Advanced Financial Planning, 20922 Paseo Olma, El Toro, CA 92630.

Nutshell Information Manager, a data management program, offers text fields without size restrictions, fully reformatting word wraparounds, and a wide variety of customized reports. It also indexes every word, sorts files in any order, and cross-indexes every file. It calculates figures or formulas and automatically updates figures in all calculated fields whenever a record is changed. For the **Leading Edge PC** and **IBM PC** and compatibles; $395. Leading Edge Products, 55 Providence Hwy., Norwood, MA 02062.

Practicalc II

Aimed at household and light business applications, this spreadsheet offers a variety of powerful text editing and search/sort functions. It can be used to balance a checkbook, maintain lists and files, prepare financial statements, and produce business forecasts. For the ***Apple II and IIe;*** *$69.95. Micro Software International, The Silk Mill, 44 Oak St., Newton Upper Falls, MA 02164.*



Property Management performs bookkeeping functions for residential and commercial properties. Financial records, including income and expense summaries and individual tenant records, can be generated for as many as 1000 rentors or leasors, depending on hardware configuration. For the **IBM PC** and **XT, Compaq, Columbia, Texas Instruments Professional Computer, Wang,** and **Apple II** and **IIe;** $495. Arrays Inc./Continental Software, 11223 South Hindry Ave., Los Angeles, CA 90045.

Salesprompt lets salespeople create and update custom-designed presentations and training programs. Features include a product comparison chart, a keyword directory, a word processor, and a feature/benefit mode that stores thousands of facts and selling statements in up to three levels. For the **IBM PC** and compatibles; $495 (sales representative's package, $99). Infacs Corp., 240 Grand Ave., Leonia, NJ 07605.

Venture, a financial modeling package, helps you perform business planning, strategic planning, and capital investment analyses. The program models existing businesses, new ventures, or capital projects. It generates income statements, balance sheets, financial ratios, amortization schedules, and many other reports. For the **IBM PC** and **XT;** $495. Venture, c/o Weiss Associates, 127 Michael Dr., Red Bank, NJ 07701.

Graphics

Chartpak 64 provides professional-quality, high-resolution images. You can choose pie, bar, and line charts and build them interactively. You control each chart's labeling, scale, and screen position. The program supports Commodore 1515 and 1525F, Epson, Gemini, and Okidata printers. For the **Commodore 64;** $42.95, disk. Abacus Software, POB 7211, Grand Rapids, MI 49510.

New Software provides up-to-date listings of recent releases in microcomputer software. Descriptions are based on information supplied by the manufacturers and are not to be considered endorsements of the products. Companies continually offer new versions of popular programs for different machines. Please check with the manufacturer or a dealer to find out if a program is available for your computer. For in-depth evaluations of some of these programs, see our Software Review section.

NEW SOFTWARE

Doodle lets you draw graphic designs using a joystick or trackball. The program offers 16 colors, 10 drawing instruments and modes, color-coded menus and visual clues, and an enlargement mode. Designs can be saved on disk or output to a graphics printer. For the **Commodore 64;** $39.95. City Software Distributors, 735 West Wisconsin Ave., Milwaukee, WI 53233.

Flying Colors

This drawing program produces thick or thin lines, automatic circles and boxes of any size,

*and has color fill and erase modes. It also offers adjustable drawing speeds and a wide selection of brushes and colors. Text can be added anywhere onscreen. A slide show routine is included. For the **Apple II and IIe** and **Commodore 64;** $39.95. The Computer Colorworks, 3030 Bridgeway, Sausalito, CA 94965.*

GraphiC, a presentation-quality graphics system especially designed to handle scientific calculations, contains 40 graphics routines written in the C programming language. Programmers can call the routines to plot data on a variety of dot-matrix printers or to make text slides. All plots are created and stored in a Tektronix format of 4096 by 3120 pixels. For the **IBM PC** and **Corona;** $150; requires the C-Ware DeSmet C compiler. Scientific Endeavors, Route 4, Box 79, Kingston, TN 37763.

PC-2 Graphics Pak lets pocket computer users draw horizontal bar, vertical bar, bar-segment, pie, line, and point charts. You enter data via the keyboard and the program turns it into chart form using various combinations of shading and labeling. Data files can be stored on tape. For the **Radio Shack TRS-80 Pocket Computer Model PC-2;** $19.95; requires printer/cassette interface. Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.

Visualizer turns your computer into an electronic slide projector. You draw animated images, choosing from among 128 colors and 6 animation routines. Completed screens are chained together and can be sequenced with the system's built-in timer. Single-key commands permit the automatic creation of circles, ovals, boxes, borders, and diagonals. An optional audio package lets you add music and narration to your presentation. For **Ataris** with 48K bytes of user memory and a disk drive; $49.95 (audio option, $39.95). Maximus Inc., 6723 Whittier Ave., McLean, VA 22101.

Games

C'est La Vie is an arcade-type fantasy game that has you picking money off the streets. Invest your newfound wealth in the bank or the stock market, but beware of tax collectors, thieves, and loan sharks. For the **Apple II** and **IIe, Commodore 64,** and **Atari** systems; $19.95, disk or cassette. Adventure International, Box 3435 155 Sabal Palm Dr., Longwood, FL 32750.

The Heist, a high-resolution adventure, puts you in control of superspy Graham Crackers. Follow along as he infiltrates the headquarters of a terrorist gang. It's up to you and Crackers to find the secret microfilm before the gang rubs you out. For the **Apple II** and **IIe,** $40, and **Commodore 64,** $35. Micro Lab Computer Products, 2699 Skokie Valley Rd., Highland Park, IL 60035.

Mayor Harold vs. Fast Eddie is an arcade-type game with a political slant. You play the role of an alderman in a major midwestern city. Just as in the real political arena, you must choose sides and then eliminate the opposition with ruthless trickery, agility, and speed. The game includes sound effects, music, color graphics, and five different levels of play. For the **Commodore 64** and **VIC-20,** joystick required; $12.47. Sell & Richmond Communications Inc., Suite 5804, 505 North Lake Shore Dr., Chicago, IL 60611.

Micro Games is a package of five favorite arcade-type games: Pong, Breakout, Egg Catch, Lunar Lander, and Horse Race. For the **Radio Shack TRS-80 Micro Color Computer MC-10;** $9.95, cassette. Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.

Nomination takes the presidential selection process out of the smoke-filled rooms and puts it on your video screen. Players must participate in five sets of primaries, deal with the press, allocate resources, issue position statements, make endorsements, and decide whether to use dirty tricks. Players assume the roles of such national figures as Ronald Reagan, Walter Mondale, Jack Kemp, and Gary Hart. For up to five players. For the **IBM PC;** $29.95. The Brady Co., Bowie, MD 20715.

Space Taxi is an arcade-type game that places you in the driver's seat of a 23rd century flying cab. The object is to rack up fares and avoid hazards as you explore each of the game's 24 screens. Earn enough dough, and you receive a bonus "mystery" screen. For the **Commodore 64;** $29.95; requires joystick and disk drive. Muse Software, 347 North Charles St., Baltimore, MD 21201.

Education

Arith-Magic II contains three games and four tutorial programs that instruct students in the fundamentals of important mathematical concepts. The Squ/area Game shows patterns in perfect squares, the Rectangle Game lays groundwork for later work in factoring, and the Per/area Game provides practice with area and perimeter as well as a basis for inquiring into the comparison of sets of numbers. For grades 4 and up. For the **Apple II** and **IIe;** $35. Quality Educational Designs, POB 12486, Portland, OR 97212.

Bar Mitzvah Compu-Tutor is an educational aid for young Jewish people preparing for a bar or bat mitzvah. The program provides tutoring on Haftarah melodies using either a Hebrew text (Ashkenazic or Sephardic) or an English transliteration. Programs are individually customized for each student. For the **Apple II, IIe,** and compatibles and **Ataris;** $49.95. Davka Corp., Suite 843, 845 North Michigan Ave., Chicago, IL 60611.

Countries, States, and Capitals challenges students to guess the capitals of more than 230 countries, states, and provinces. The menu-driven program includes testing, teaching, and self-study modes. It also provides three difficulty levels, printer support, and scoring for up to 15 students at a time. For grades 6 to 12. For the **Radio Shack TRS-80 Models I, III** and **4** in III emulation mode; $22.50, disk; $17.50, cassette. DeZoysa Enterprises, POB 170, Keyport, NJ 07735.

Diskovery Reading Works helps children improve their learning rate and schoolwork. Animated graphics, color, and sound increase your child's learning motivation; arcade game formats make learning fun, easy, fast, and long lasting. The four programs are Alphabet Factory, Match-Up, Word Bird, and Time Zone. For the **Commodore 64** and **Atari; $29.95 each.** Gladstone Electronics, 1585 Kenmore Ave., Buffalo, NY 14217.

The Grabit Factory teaches youngsters basic number-recognition skills. Using a joystick- or keyboard-controlled crane, the child must pick up number blocks that either match a computer-generated number or complete a simple mathematical equation. For ages 5 to 8. For the **Apple II, IIe,** and **IIc, Franklin Ace,** and **Commodore 64;** $39.95. Eric Software Publishing, 1713 Tulare, Fresno, CA 93721.

Lucky's Magic Hat helps both children and adults improve reading comprehension, sequential thinking, and memory skills. The program uses self-paced games that provide a variety of learning formats. An authoring system lets you create original artwork. For ages 5 to adult. For the **Apple II** and **IIe;** $39.95 (additional subject disks, $19.95). Advanced Ideas Inc., Suite 104, 2550 Ninth St., Berkeley, CA 94710.

Medalists, a set of six programs, provides instruction on a variety of social studies topics. Titles consist of Continents, States, Black Americans, Women in History, Presidents, and Create. For elementary and junior high school students. For the **Apple II** and **IIe;** $39.95 each. Hartley Courseware Inc., POB 431, Dimondale, MI 48821.

Spell-It, a spelling instruction and testing system, uses both audio and visual learning techniques. A supplied cassette recorder interface lets students hear verbal instructions, word pronunciations, and other audio enhancements. The package's authoring program permits teachers to create their own spelling lessons and tests. For the **Apple II** and **IIe;** $179. Multimedia Software, POB 5909, Bethesda, MD 20814.

Turtle Toyland Jr. teaches children ages 6 and up fundamental computer concepts. They explore a variety of computer-related activities by manipulating a joystick-controlled turtle. Topics covered include graphics, music, and input/output operations. For the **Commodore 64;** $34.95. Human Engineered Software, 150 North Hill Dr., Brisbane, CA 94005.

Home

Ancestors is a genealogy program that lets you create, modify, and display records on up to 500 family members. Each record holds 22 data fields, including information on birthplace and date, marriage, occupation, religion, residence, military service, spouses, parents, date of death, and burial place. Generates family group sheets and pedigrees. For the **Radio Shack TRS-80 Color Computer;** $39.95, disk. Autumn Color Software, 4132 Lay St., Des Moines, IA 50317.

Coins helps numismatists determine the value of their collections. The program lists and evaluates 1600 common U.S. coins. Nonstandard coins can be listed but not evaluated. Generates purchase, sales, and inventory reports. Optional quarterly update disks provide current market prices. For the **IBM PC, XT,** and **PCjr, Apple II** and **IIe,** and **Radio Shack TRS-80 Models I** and **III;** $95. A Preview Pack (manual only) is available for $10. CompuQuote, 6914 Berquist Ave., Canoga Park, CA 91307.

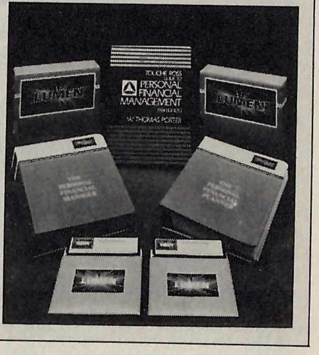
jrQuote is a real-time stock and commodity price quoting system. Using online data, the system tracks price quote, daily high, daily low, volume, open and settle, bid, ask, close, and time-of-last-trade statistics. Audible and visual signals are activated when a price crosses a preset limit. Generates historical price charts. For the **IBM PC, XT,** and **PCjr;** $495. Commodity Trading Systems, Suite 107, 11301 Richmond Ave., Houston, TX 77082.

Songwright, a song and lead-sheet generator, lets you compose, save, edit, transpose, play, and print musical scores. It supports a full two-octave range, multiple time signatures, and chordal harmony. The program permits precise alignment of lyrics and chord notations with notes. For the **IBM PC** and compatibles; $24.95; requires an IBM or Epson graphics printer. Songwright, 928 Fillmore St., Denver, CO 80206.

Time-Trax is an appointment and scheduling system that notifies users of events 15 minutes to 14 days in advance. The package, which includes a real-time clock module, permits searches and printouts of personal calendars and schedules. ProDOS compatible. For the **Apple II** and **IIe;** $99.95. Creative Peripherals Unlimited, 1606 South Clementine, Anaheim, CA 92802.

Personal Finances

***The Personal Financial Planner** and **The Personal Financial Manager** include modules on investment strategies, insurance analysis, tax and estate planning, personal data, cash flow analysis, future financial requirements, and net worth statement. They also handle budget tracking, tax transactions, and a number of miscellaneous reports. For the **IBM PC, XT,** and **Compaq;** $200 each. Prentice-Hall Inc., Englewood Cliffs, NJ 07632.*



Technical Tools

Barsum, a linking loader and subroutine manager, lets you load subroutines to any of three memory areas, call subroutines by name instead of line number, and chain programs while retaining variables, file buffers, and protected subroutines. It also allows you to store subroutines in individual, program-accessible files. For the **Radio Shack TRS-80 Models I** and **III;** $149.50. Wiley Inc., Suite B-2, 841 Bishop St., Honolulu, HI 96813.

Cross/File, a file editor/reformatter, transfers data between mainframe and minicomputer databases and microcomputer applications programs. Compatible with DIF, SYLK, SDF, and ASCII files and such popular programs as Visicalc, Lotus 1-2-3, Multiplan, Wordstar, and dBASE II. For the **IBM PC** and **XT, DEC Rainbow, Wang PC, Panasonic PC, Ericsson Step/One, MS-DOS-, CP/M-80-,** and **CP/M-86-based** systems; $195. Axelsoft, 666 Howard St., San Francisco, CA 94105.

Disk Drive Analyzer gives your disk storage devices a thorough once-over. The program checks your drive's radial alignment, clamping ability, speed, and read/write accuracy. For the **Apple II**

and **IIe** and **IBM PC, XT,** and **PC Portable;** $39.99. Nortronics Co., 8101 Tenth Ave. N., Minneapolis, MN 55427.

Electric Magazine is an electronic bulletin board system that features message and file databases, a sysop paging mode, and a self-regulating structure that automatically erases old messages as new ones are added. Written in BASIC. For the **Commodore 64;** $39.95; requires disk drive and modem. D&B Software, POB 2154, Columbus, MS 39704.

Copylink-PC

*A communications package, **Copylink-PC** features XMODEM protocol support, automatic dialing and redialing, on-line viewing of disk files, audible error prompts, and user-defined parameters. It supports direct-wire data transfers to over 30 types of CP/M and MS-DOS formats at speeds of up to 19,200 bits per second. Works with virtually all Bell 103- and 212-type modems. For the **IBM PC** and compatibles; $99.95. U.S. Digital Corp., 5699-D, S.E. International Way, Milwaukie, OR 97222.*

hfTools for Diskette Security helps you protect sensitive files and programs. A six-character password key safeguards such sensitive information as personnel files, client lists, medical records, and financial plans. A disk's key can be changed with each use. For the **IBM PC** and compatibles; $75. H-F Computing Services, 224 Old Orchard Grove, Toronto, Ontario, Canada, M5M 2E5.

VPM Math Pak helps Z80/8080 assembly-language programmers incorporate precision math routines into their programs. Supplied applications include a 255-string comparison, binary-to-integer and integer-to-fraction conversions, and a binary floating-point numeric comparison. The package also includes a routine that converts ASCII strings to binary floating-point storage and vice versa. For the **Radio Shack TRS-80 Models, I, III** and **4;** $69.95. Alphabit Communications, 13349 Michigan Ave., Dearborn, MI 48126.

Z80 and 8085 Interpreter allows any self-contained program that is designed to work with a Z80- or 8085-based computer to run on a Commodore 64. The system includes nine registers, 2K bytes of memory, and more than 200 instructions. For the **Commodore 64;** $69.95. Softechnics, 3212 Beacon Ave. S., Seattle, WA 98144.

Languages

Applications BASIC, an interpreted business-oriented language, features built-in ISAM structures, automatic decimal rounding, numeric to string conversion with masking, and automatic variable passing between program segments. It also supports random and serial files with as many as 65,535 records per file and 32,767 characters per record. For the **IBM PC** and compatibles, **PCjr,** and 8-bit **CP/M-based** systems; $395. Soft Gold Inc., Suite 466, 3857 Birch St., Newport Beach, CA 92660.

C Compiler for the **TRS-80 64K Color Computer** and the OS-9 operating system takes advantage of features of the 6809 microprocessor. The 6809's stack-oriented instruction set and versatile repertoire of addressing modes are especially well suited for the C language; $99.95. Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.

MS-BASIC Compiler gives programmers the advantages of working with a compiled language with the ease of use offered by a BASIC interpreter. Together the interpreter and compiler let you create, test, and modify programs in an interactive mode and then compile the program to improve performance in the execution of the final version. For the **TI Professional** and **Portable** computers running under the MS-DOS 1.1 or 2.1; $300. Texas Instruments, Data Systems Group, POB 402430, H-709, Dallas TX 75240.

Sure-Wing C Compiler is a full implementation of the C language as defined by Kernighan and Ritchie in *The C Programming Language.* Features include full floating point, I/O support library, all standard control structures, unions, and type definitions. Its two-pass compiler produces files compatible with the PC-DOS linker. Assembled subroutines can be linked in and called from C routines. Includes source code for library functions. For the **IBM PC** and **XT,** requires two 320K-byte drives or one 320K-byte drive and one hard disk; $100. Sure-Wing Systems, POB 20008, Oakland, CA 94620.

Word Processing

Scribe is a compact (3.2K-byte) word-processing program for two portable computers. Features include automatic paging and numbering; menu control; headers; printer control code support; standard formats for pica, elite, and micro-size type; and adjustable margins and indents, and file chaining. For the **NEC PC-8201** and **Radio Shack Model 100;** $29.50. Chattanooga Systems Associates, POB 22261, Chattanooga, TN 37422.

Select Bilingual: The Spanish/English Word Processor includes bilingual help screens, menus, and commands. It offers on-screen boldfacing and underlining, real-time paragraph justification, horizontal scrolling, and other text-formatting, printing, and editing features. Also included are a Spanish/English spelling checker and mailing list merge/print function. For the **IBM PC** and compatibles; $395. Select Information Systems, 919 Sir Francis Drake Blvd., Kentfield, CA 94904.

Starpolish provides Wordstar users with on-screen boldface, underline, italics, and super- and subscript characters. It also extends Wordstar support to a variety of popular dot-matrix printers, avoiding the problem of installing patches. For the **IBM PC** and **Victor 9000;** $95. TDI Systems, Suite 33, 620 Hungerford Dr., Rockville, MD 20850.

Word-Jr offers a full-screen text editor, global changes, block moves, help screens, function key support, and underlining and boldfacing. A built-in file merge capability is also included. For the **IBM PCjr;** $59. Micro Architect Inc., 6 Great Pines Ave., Burlington, MA 01803. □

RANDOM ACCESS

A wide-ranging look at ways to get more from your personal computer

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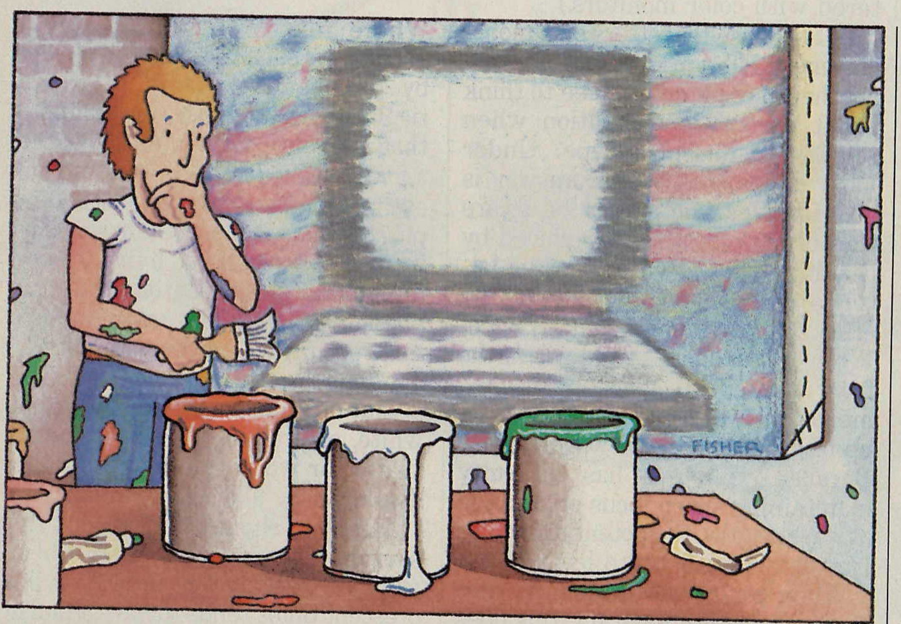
When Background Software Intrudes Page 179

Computers That Can Do Two Things At Once Page 180



Choosing a Color for Monochrome CRTs

You've finally decided. After poring over computer magazines and questioning everyone you know who owns one, you've identified the one personal computer that seems to suit your needs. With an enormous sense of relief, you march confidently into the computer store ready to buy—all your decisions are made. Except for one.

"Do you want green, white, or amber letters with your video display?" the salesperson asks. At this point you realize still more questions stand between you and a personal computer. But don't be dismayed—answers are available. When selecting the character color for a video display, you need to consider the kind of work you'll be doing with your computer and where you'll be doing it. But first let's review the basics of video screens.

The Cathode-Ray Tube

When you look at a video screen, what you actually see is the front surface of a *cathode-ray tube* (CRT). This is the part of a video terminal responsible for displaying characters (see "Inside a CRT," February 1984, page 128).

If you know what makes a firefly's tail light up, then you know how a CRT works: both fireflies and CRTs produce light by a process known as luminescence. In the case of the firefly, its tail contains a chemical pigment that glows whenever the insect transmits electric current to its tail. In the case of the CRT, the back surface of the screen is coated with a special substance, called *phosphor*, that emits light when it's struck by an electron beam. Thus, the characters displayed on the CRT are electronically painted on the screen, with the phosphor serving as the pigment.

Phosphors come in different types, and each type emits energy from a particular region of the light spectrum. The color of the characters you see on the screen depends on the type of phosphor used. White letters are usually produced by a phosphor known as P4, green letters by a P31 phosphor (the one notable exception is the IBM PC, which uses P39), and amber letters by a P134 phosphor. Any given monochrome CRT contains only one type of phosphor, so all the letters appear the same color.

But of the three phosphor types, is one preferable? Are the different-colored phosphors equally easy to read? To answer these questions, we must turn our attention to the human eye.

Illustration by Mark Fisher

The Eye's Sensitivity

Light consists of energy at various wavelengths, and it is the wavelength composition of light that determines the colors we see. For instance, light consisting of short wavelengths appears blue, and light consisting of long wavelengths appears red.

The human eye is not equally sensitive to all wavelengths of the light spectrum. When you look at light of different colors but of the same physical intensity (such as the colors of a rainbow), you'll see that colors near the middle of the visible spectrum appear brighter than those at the extremes. The eye is not very receptive to deep blue or deep red but is quite sensitive to the yellow-green region of the spectrum.

The eye's differential sensitivity to color has practical importance: for objects (such as letters on a video screen) to be most visible, they should be composed of wavelengths from the middle of the spectrum. White, green, and amber phosphors all generate light energy from this middle region. For a given intensity level, the green phosphor should appear a little brighter than the white or amber because more of its light energy is concentrated near the part of the spectrum where our eyes are most sensitive. This is of little concern, however, because all monitors include a brightness control that lets you adjust the intensity of the display to a comfortable level.

Acuity and Color

Color also influences our ability to distinguish letters from one another. For instance, discriminating the word "how" from "now" requires being able to distinguish "h" from "n." This kind of discrimination involves what is known as *visual acuity*, the ability to see fine detail. If you view this page from a distance of 10 feet, you'll have difficulty discriminating the small, closely spaced letters. Your acuity, in other words, limits the ease with which you are able to read.

To achieve good acuity, your eye must form a sharp, well-focused image on your retina. The eye's lens, an automatic focusing mechanism, continuously strives to keep the image of whatever you're looking at in focus. However, it is optically impossible for the eye to bring all wavelengths of light into sharp focus at the same time, a limitation known as *chromatic aberration*. This optical limitation usually goes unnoticed, but if words were made up of letters of different colors, some letters might appear slightly blurred in comparison to others. (This is, in fact, one of the problems encountered with color monitors.)

But because the letters on a monochrome CRT don't differ from one another in color, do we need to think about chromatic aberration when selecting a phosphor type? Under most circumstances the answer is no. However, you should be aware that of the characters produced by the three phosphor types, white letters are the most susceptible to the effects of chromatic aberration. White light consists of wavelengths from the entire spectrum, which means that white letters are made up of a wide range of wavelengths. Because your eye has difficulty maintaining sharp focus on a range of wavelengths, the potential for blur is greatest with white letters.

When you're working under normal levels of illumination, this does not pose a problem. Under these conditions, the pupil of the eye will improve the focus by constricting, thus preventing light from passing through the peripheral portions of the lens where chromatic aberration is greater. But under dim illumination, your eye's pupil dilates and no longer counteracts the blur caused by chromatic aberration. So if you anticipate working at a video terminal for long periods in dim illuminations, you should think seriously about choosing either a green or amber display.

Chromatic aberration isn't the only way color influences your visual acuity. Even with sharply focused letters, acuity is somewhat poorer for blue characters than it is for green or orange ones. (Incidentally, this is one reason that road signs printed with blue letters might be more difficult to read, especially at night.) And again, it's the white letters—with their bluish hue—that could conceivably pose problems. However, white letters would have to be quite small and closely spaced before reading would be hindered. Assuming you're going to be working about arm's length from the video display, you should have no trouble distinguishing the displayed characters regardless of whether they are green, amber, or white.

Where You Work

The eye's sensitivity can be altered by prolonged exposure to a particular color. Suppose, for example, that you stare for a minute or so at a green wall. The receptors in your eye responsive to that color will temporarily lose some of their sensitivity, and as a result you'll find it more difficult to see green objects. This phenomenon, called *color adaptation*, occurs whenever you look for any length of time at one color. So if your office is dominated by green, white, or orange, it's best to avoid that color when selecting the color displayed by a video terminal.

Also, you should think about the source of lighting in the room where you'll be working. The light from fluorescent bulbs tends to have a bluish hue, while the light from tungsten bulbs appears slightly more yellowish. All other things being equal, white letters have a bit more contrast when viewed under tungsten light, and amber and green letters fare better under fluorescent light. These effects are so small, though, that you shouldn't use this as a real criterion.

While on the subject of adaptation, let me mention a harmless color illusion that you might experience after working at a video terminal displaying either green or amber characters. Several unsuspecting victims, including my wife, described this illusion to me. My wife had spent the better part of an afternoon writing a program using a terminal with green characters. During a

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break, she was surprised to see that chalk marks that previously looked white on a blackboard now appeared distinctly pink. What she had unwittingly discovered was the McCullough effect, a color illusion described by psychologist Celeste McCullough in 1965. If you stare at a set of lines of a particular color for several minutes, white lines of the same width will appear colored. The illusory color depends on the color of the lines you stared at. If you stare at green lines, the white lines will appear slightly red; if you stare at red lines, the white lines will appear slightly green.

Staring at a video terminal with colored letters, as many of us do, creates just the right conditions for generating the McCullough effect. For me, video displays with green letters produce a more vivid aftereffect than displays with amber letters. And some individuals seem immune to the illusion altogether. In any event, the illusion is harmless and dissipates with time. In fact, playing with the McCullough effect can provide a welcome break from the drudgery of working at a video terminal.

Your Task

Most of us use personal computers for word processing, financial analysis, or data storage and retrieval. For these chores it makes little difference whether we use video terminals with amber, green, or white characters.

However, for some applications character color can be crucial. For instance, if your work entails photographing alphanumeric or graphic information directly from the screen, you should consider selecting a terminal whose CRT uses the white, P4 phosphor. Unlike your eye, most types of photographic film are quite sensitive to blue light. And of the three available types of phosphor, the P4 contains more energy in the blue region of the light spectrum. Because it more closely matches the light sensitivity of film, this phosphor may give you better results for photographic work.

Perhaps you intend to program your computer to generate displays depicting lots of action, such as a video game. For applications involving this sort of animation, you might need to erase one set of characters before displaying the next set. To accomplish this you'll be better off with a CRT that uses green characters; the green P31 phosphor has a very short persistence, meaning that the green characters fade quickly from the screen.

Finally, consider whether you'll be wearing tinted glasses or contact lenses while working at the computer. If so, select the phosphor color that most closely matches the color of the tint—this will yield brighter, more distinct letters.

Aesthetic Considerations

In the final analysis, your decision may boil down to which phosphor type produces the color that is most "pleasing" to you. Don't feel foolish letting personal preference color your decision—we all have favorite colors, and it makes sense to select one that we like. After all, you'll probably spend lots of time at the terminal, so why not enjoy the color you're looking at?

And don't be concerned about the possible emotional consequences of looking at one color or another. I'm aware of no scientific evidence showing that letter color influences mood. If you get angry during a session at the terminal, blame yourself or the computer, not the color of the characters.

One final note. A video monitor is one of the cheaper components involved in purchasing a personal computer. If after working with one particular screen color you regret your original decision, consider trading in your video monitor for one with a different CRT. Screen color, after all, should not be a "terminal" decision.

—Randolph Blake

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When Background Software Intrudes

We've heard a great deal of talk lately about so-called multitasking systems that enable microcomputers to perform several operations simultaneously. While these may well be the wave of the future, many of us with today's technology have discovered that even standard single-tasking operating systems such as CP/M or MS-DOS can take advantage of certain programs especially designed to run "in the background" at the same time that input-oriented applications are running in a more active mode.

Background software such as RAM-disk programs, print spoolers, and keyboard enhancers can go a long way toward making computers faster and easier to use, but because the operating system is essentially unaware of their existence, problems can arise. While most background programs have been designed to work in concert with popular applications software, occasionally an applications program will do something that stymies the background software and causes a conflict.

For instance, when I tried to run Microsoft Word on my IBM Personal Computer with Rosesoft's Prokey keyboard enhancer in the background, the system froze at the moment I began to use the Microsoft mouse. Anticipating that the background program could be part of the problem, I called Rosesoft to see if the company had any insights.

David Rose, the author of Prokey, had a ready answer. He explained that the problem occurs because Microsoft Word uses the PC's keyboard buffer to store commands for the mouse. Prokey gets very confused when it tries to read these mouse commands from the keyboard buffer, and the system freezes. He added that his company and Microsoft are working on the problem and that it would probably be resolved in version 3.1 of Prokey.

Excuse the Interruption

Background programs can also fight with other background programs. For instance, an early version of Prokey just couldn't get along with Qspool, the popular print-buffer program from Quadram Corp. The root of this incompatibility, according to Rose, involved the IBM PC's "interrupts."

An interrupt is a special control signal that allows a piece of peripheral equipment, such as a keyboard or a disk drive, to get the central processor's attention. Programmers who write background programs often insert little detours in the path taken by an interrupt. Prokey, in particular, jumps into action whenever it sees a keyboard interrupt. But what if another background program also responds to the same interrupt?

A programming technique called "daisy chaining" was developed to avoid conflicts over the use of interrupts by passing the necessary signals along to each program in turn. Properly implemented, this technique should accommodate more than one background program. What happened with Prokey and Qspool, then?

Prokey's conflict with Qspool occurred, Rose said, because the print spooler didn't completely follow the rules. It changed some of the data passed along the daisy chain, and Prokey was programmed to quit working if it saw unexpected data. Later versions of Prokey ignore unexpected data and thus resolve this particular incompatibility.

Rose hopes that future versions of the PC-DOS operating system will include a mechanism for making

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sure that programs in the background behave themselves, but in the meantime, here's some advice for you if you suspect that your programs are fighting among themselves. First, try to isolate the problem. Remove programs from the system one by one until you can determine which two aren't getting along. Then, describe the problem to the manufacturer, who may be able to give you a quick fix that will circumvent the conflict. If the problem is more complex, the manufacturer should be alerted so that future versions of the program can take the problem into account.

Perhaps the best medicine, though, is prevention. If you have some favorite background programs, take them down to the computer store and try them with any new program you're thinking of adding to your library. Similarly, check out your favorite applications programs with any new background software you're considering. You'll be rewarded with a system that really can do more than one thing at a time.

—Dara Pearlman

Computers That Can Do Two Things at Once

One department manager in a large manufacturing company uses the multitasking capabilities of his personal computer to combine processing jobs at the busiest time of the day—late afternoon. While his computer sorts a major inventory database in "background" mode, the manager can update personal calendar items at the same time, saving the 30 minutes he used to spend each afternoon preparing for the next day.

An owner of a small but growing retail business relies on concurrent-processing to get "twice the computing" out of a single personal computer that already works more than eight hours each workday.

Whether used for personal convenience, as in the first example, or for boosting productivity, as in the second, the multitasking or concurrent processing features of personal computers can offer significant improvements in performance for many of today's business users. While the potential for concurrent processing should not be the prime reason someone selects a particular personal computer, once basic hardware and software objectives are met it could become a key factor. Not only can concurrency save time and, in the case of the small-business owner, money, but it can also pay more subtle dividends by giving easier access to software that otherwise might be wasted.

Degrees of Concurrency

In general, concurrent processing is a feature of larger computers that is rapidly finding its way to many of today's relatively inexpensive business microcomputers. Basically, concurrent processing means doing two things at once, whether it's two (or more) users accessing the same computer in timesharing style or a single user performing two applications at once. In either case you're getting greater performance from your equipment, but you're not getting it for nothing. Concurrent processing requires added computer resources in either software or hardware. Also, because each of the several ways of achieving concurrent operations has its own specific advantages and disadvantages, it's best to evaluate alternatives in light of real application needs.

The simplest method of concurrent processing has more than one person accessing the same program under a multiuser operating system such as MP/M or Unix. In such a scheme the operating system apportions internal resources—including the central processor, system memory, and input/output operations—between or among two or more simultaneous users. The multiuser operating system resolves any conflicts, such as attempts to access the same record at the same time. Although it seems as though each user is working with a dedicated machine, the computer is actually dividing its processing time among all users. As a result, if one user's program suddenly calls for extremely heavy processing, the other users may find their response times dramatically slowed.

But a different approach to concurrency, often called multitasking, is likely to be more widely used. Multitasking allows a single user to run two different applications on the same machine at the same time. Self-contained chores such as batch updates or communications transmissions are handled in a background mode while more interactive, input-oriented tasks are done in the foreground. In a small manufacturing business, for example, such a system would let you sort and update personnel files in the background while you process customer orders or run parts-tracking applications.

Concurrent CP/M, a multitasking version of CP/M-86, is a recently introduced operating system that can process as many as four programs at once in multitasking fashion. MS-DOS, still a single-user, single-tasking operating system, may soon add multitasking features in order to compete with Concurrent CP/M.

Hardware Solutions

Both multiuser and multitasking operating systems are software-based solutions that deal with the problems generated by contending users. They depend on administrative-type software to manage and ar-

---

Rick Hunteman is manager of personal computer marketing for Xerox Corp.

bitrate among conflicting users or program requests for processing time, and they require greater resources for the added "traffic cop" functions. The disadvantage inherent in both approaches, however, is one of limited hardware: whenever one user or program makes inordinate demands on the central processor, other contending users or programs suffer delays.

The newest personal computers are therefore putting concurrent processing capabilities into hardware. With the costs of hardware continuing to drop, multiprocessor architectures are gaining in popularity. Typical implementations feature side-by-side 8- and 16-bit processors to handle the load of contending users or programs.

More advanced multiprocessor designs go a step further by letting the user determine at all times which processor should be used for each specific application. This selection can be dictated by the software available or by the level of processing power a given application requires.

The difference between these two approaches is important. The more limited approach utilizes dual processors but does not let you directly select which processor will handle which application. These systems typically dedicate the 8-bit processor to input/output operations and require all normal word- and data-processing applications to go through the 16-bit processor.

The second approach, in which any application may be processed by either chip, is far more flexible and often more cost-effective. The user decides which processor is more appropriate for each application, thus putting processing power to its best use at all times.

For example, in word-processing applications involving documents typically no longer than 8 or 10 pages and processing speeds limited to the operator's keyboard input, an 8-bit processor will do the job just as quickly as a 16-bit unit. But if documents are longer than 10 pages, the 8-bit processor will begin to get bogged down in swapping files from disk to internal memory. For such word-processing jobs, the 16-bit processor is likely to be more cost-effective.

Users of advanced dual-processor microcomputers can therefore closely tailor their systems to exact application needs. They can frequently make use of existing 8-bit applications programs but still have 16-bit number-crunching power where it's most useful. A user who typically works with short documents may run a less expensive 8-bit word-processing program, for instance, while putting the more demanding spreadsheet applications on the 16-bit side of the personal computer.

The flexibility of controllable dual-processor concurrency adds a new dimension to business computing, for it puts the user in a very powerful position. Indeed, the user of such a system becomes a human interface between applications, introducing a level of specificity and responsiveness that cannot be achieved by relying on machines alone to carry out predefined tasks. For example, a manufacturing manager might use an 8-bit program to access inventory data from a large computer while processing a "what if" manpower model on the 16-bit side. As the inventory data becomes known, or even as it changes, the manager can plug new numbers or insights into the manpower model to get more specific, and more useful, results.

This enhanced level of interactivity gives the user a much greater degree of creative freedom and spontaneity than is possible in a more straightforward serial environment. Such a system demonstrates what computing should be—not a machine taking over routine tasks, but rather a human-machine collaboration that will yield results beyond the potential of either one alone.

—Rick Hunteman

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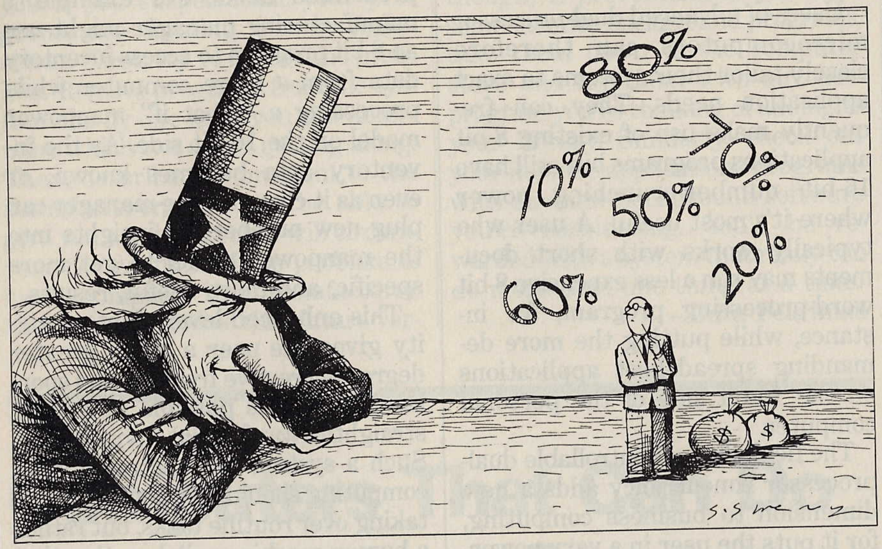
RECREATIONAL COMPUTING

A Taxing Problem

by Michael W. Ecker



We all know that the federal income tax in the United States is supposed to be a progressive one in the sense that the more you earn, the higher the rate you pay. Not only do you pay more in actual dollars, but the percentage also increases. Suppose that the tax law were amended so that there were no deductions, and you just paid a kind of flat, but progressive tax. In other words, for as many thousands of dollars that you might earn, you would pay that percent in taxes. For instance, earning $10,000 would put you in the 10% bracket; earning $90,000 would place you in the 90% bracket. If you could gross any amount under this scenario, how much in earnings would leave you with the greatest net income?

At first glance, you might think that higher is better, but the tax bite gets awfully big up there. In fact, there is a limit beyond which you get nothing. Okay, see if you can handle this by computer. You might also consider the variation in which the percent is equal to the square root of the number of thousands. What is the optimal gross income then?

```
10 PRINT "Fibonacci Numbers"
20 PRINT
30 INPUT "Stop after which term
     (n>2) ";MX
40 IF MX<2 THEN MX=2
50 PRINT
60 PRINT "Term" TAB(8) "Fib.Value"
     TAB(20) "F(n)/F(n-1)"
70 F0=0: REM First term of series
80 F1=1: REM Second term of series
90 PRINT 0;TAB(10);F0;TAB(22);"N/A"
100 PRINT 1;TAB(10);F1;TAB(22);"N/A"
110 FOR N=2 TO MX: REM n=current term
     number
120 F=F0+F1: REM Current term of series
130 FR=F/F1: REM Ratio of current to
     previous
140 F0=F1
150 F1=F
160 PRINT N;TAB(10);F;TAB(22);FR
170 NEXT N
```

Listing of Fibonacci sequence program.

A Bee's Family Tree

Recall from last month that if we look at the diagram of the male bee's family tree under the conditions described, we find that the numbers of bees in each generation are 1, 1, 2, 3, 5, 8, 13, and so on. This series of numbers is called the Fibonacci sequence, where each number is the sum of the previous two numbers in the sequence. The program listed at left gives the number of bees in each generation, that is, the Fibonacci numbers.

As you can see in the sample run (right), the numbers get quite large, and the ratios of consecutive Fibonacci numbers will get closer and closer to 1.618 . . . In fact, the exact value is the number $(1 + \sqrt{5})/2$. This number is called the golden mean.

You might enjoy an experiment to follow up with what happens with other Fibonacci-like sequences. Suppose, for instance, that you start with $F(0)=3$ and $F(1)=4$. The next few numbers are then 7, 11, 18, 29, and so on. Does the ratio of these consecutive terms approach some number? Is it a new number or the same one? What would happen if you were to use really bizarre choices for the first two numbers in the sequence, say $F(0)=10000$ and $F(1)=-.001$? □

Editor's Note: Next month Dr. Ecker will provide a solution to the income tax problem as well as present a new recreational puzzle to solve with your computer. In the meantime please send comments, questions, solutions, and suggestions to Dr. Michael W. Ecker, Contributing Editor, *Popular Computing*, 129 Carol Dr., Clarks Summit, PA 18411. Individual replies will be given if you include a large, self-addressed, stamped envelope.

Contributing editor Dr. Michael W. Ecker is Assistant Professor of Mathematics at Worthington Scranton Campus, Pennsylvania State University.

```
>RUN
Fibonacci Numbers

Stop after which term (n>2) ? 14

Term      Fib.Value   F(n)/F(n-1)
 0          0           N/A
 1          1           N/A
 2          1            1
 3          2            2
 4          3            1.5
 5          5            1.66667
 6          8            1.6
 7          13           1.625
 8          21           1.61538
 9          34           1.61905
 10         55           1.61765
 11         89           1.61818
 12         144          1.61798
 13         233          1.61806
 14         377          1.61803
Ready
```

Sample run of the program.

Illustration by Steve Sweny

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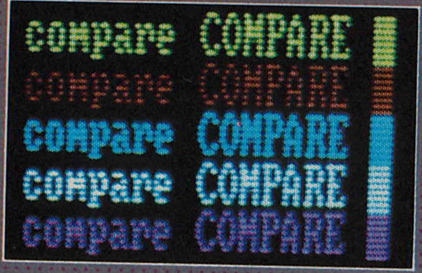

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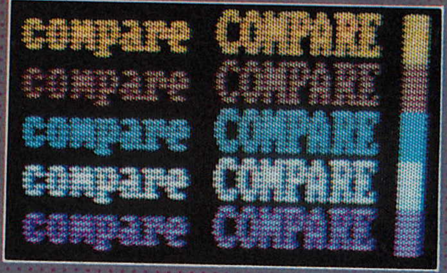

THEIRS: .43 mm dot pitch, 80 column text.

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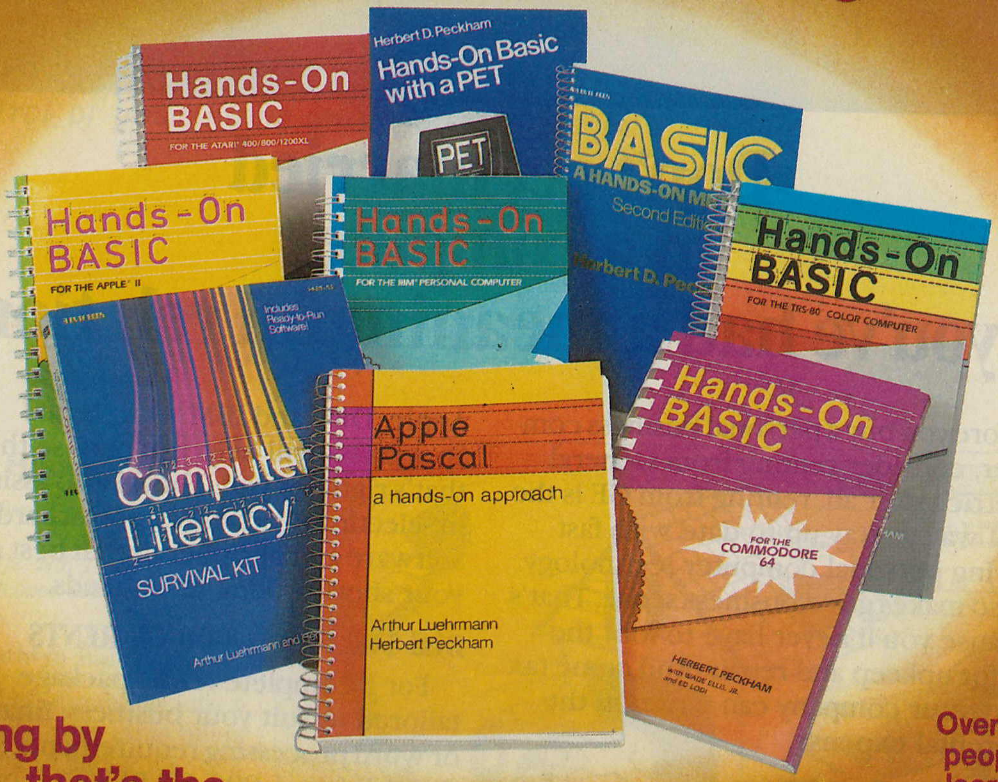

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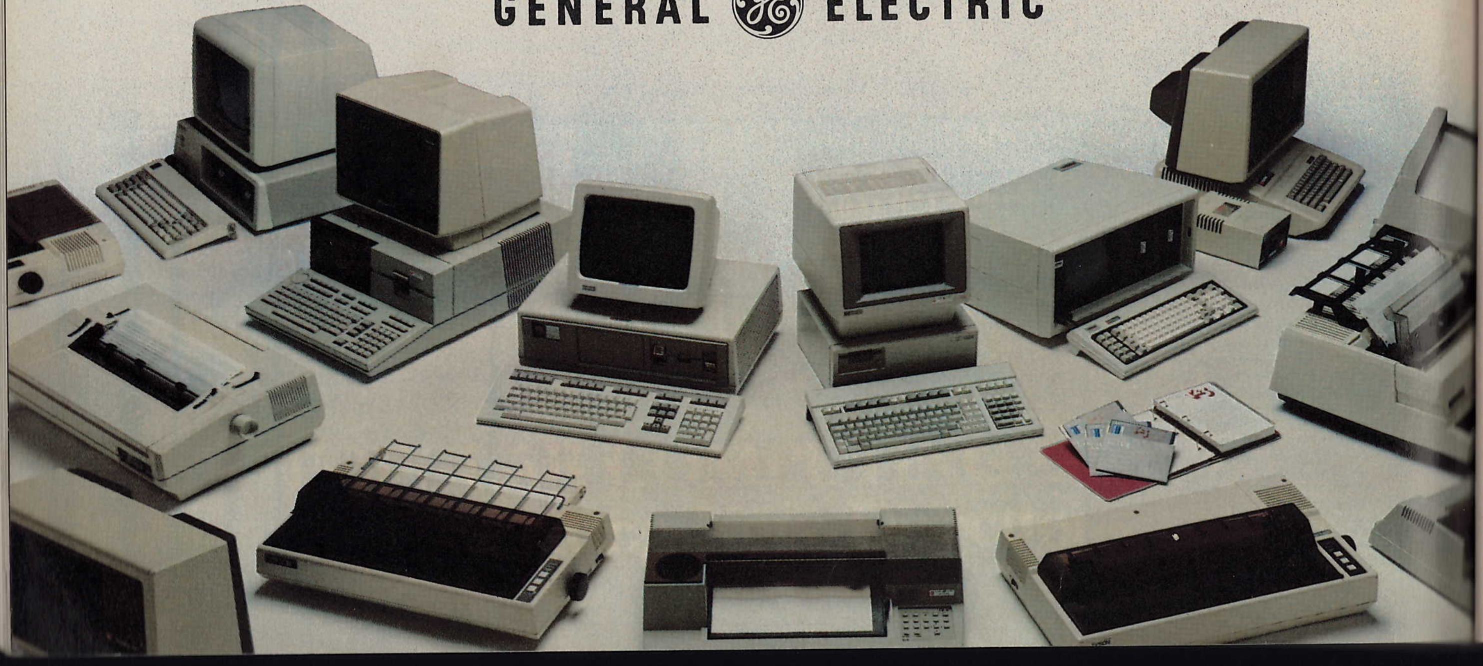


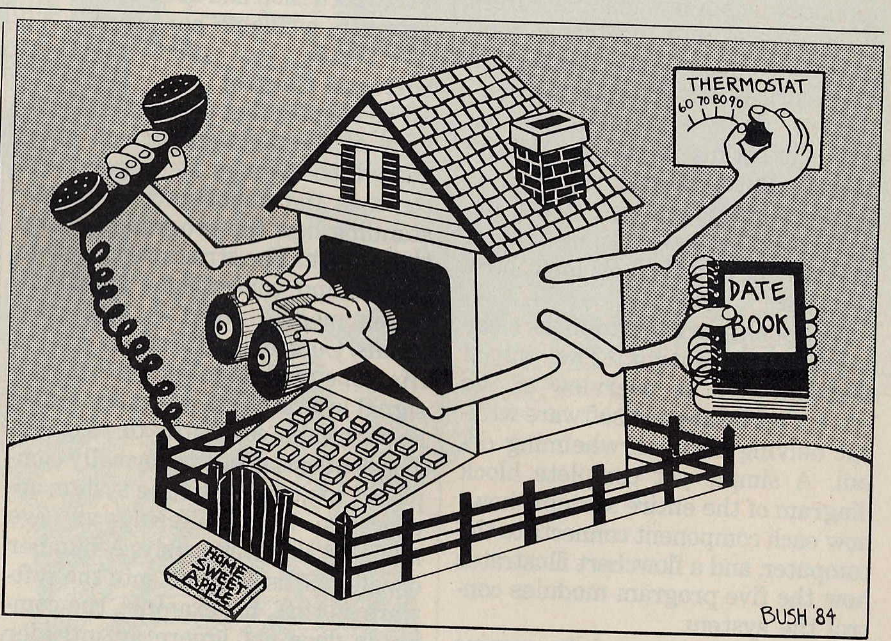
The Apple House

Take control of your home with your Apple II

The Apple House

John Blankenship
Prentice-Hall
Englewood Cliffs, NJ, 1984
153 pages, hardcover $22.95
softcover $14.95

Reviewed by Cathryn Baskin



Are you tired of stumbling into a dark kitchen with your arms full of groceries, trying to nudge the light switch on? Do you vow when the oil bill arrives to turn the thermostat down at night but then forget all about it?

All those nodding their heads affirmatively will want to read *The Apple House*. Not content to relegate his Apple II to the trivial role of gamesmaster or checkbook balancer, John Blankenship decided to put his computer in charge of his house. In *The Apple House* he presents a practical version of his computerized home-control system for readers seriously interested in expanding the usefulness of their computers or just curious about what home control really means.

If you're well versed in electronics and programming, the book can start you on your way to a computerized home. But if you lack experience in these areas, reading this book will not tell you all you need to know about the hardware and software necessary to set up a home-control system. What the book will do is give you a good idea of what's possible and what it involves. In fact, one of the strengths of *The Apple House* is that it realistically describes the complexity of a project yet gives you the sense that you can successfully tackle the job.

Blankenship's home-control system performs five major functions: it responds to your verbal commands via wireless microphones placed strategically throughout the house; it acts as an intelligent phone-answering system, answering and recording messages, automatically dialing numbers, and responding to remote calls and commands to the system; it manages security, watching for movement outside and inside the home and automatically dialing the police or neighbors if it detects an intruder; it carries out a predetermined series of events that you want done on a regular schedule; and it tracks the movement of people inside the house so it can determine when to turn lights on and off.

To get your Apple II to do all those things, you'll need quite a selection of peripherals and other devices. For readers who are less prone to tinkering than himself, Blankenship has designed a system based almost entirely on off-the-shelf hardware. Equipment required includes a voice-recognition unit, wireless microphones, a speech synthesizer, speakers, an intercom telephone, two cassette recorders, a tone generator, an ultrasonic transducer, the BSR X-10 Ultrasonic Command Console

Cathryn Baskin is an associate editor of *Popular Computing.*

Illustration by David Bush

and switches, pressure-sensitive switches, and a modem. Besides all that, a few components must be built, including two sound-detector circuits and a clock calendar.

Realizing that using off-the-shelf equipment could result in an expensive project, Blankenship encourages you to substitute less expensive parts where possible and suggests that you build some of your own equipment. The book includes discussions on building devices such as an input/output port and simple pressure-sensitive switches, and an appendix lists a few manufacturers of peripheral and electronic components. Notably absent are approximate prices for the various components. As it is, readers have no means of estimating the cost of the project. But whatever the cost, as Blankenship points out, it will undoubtedly be lower than that of commercially available home-control systems.

The book's organization is clear and unintimidating. The initial chapters give an overview of the system hardware and software without delving into overwhelming detail. A simple yet complete block diagram of the entire system shows how each component connects to the computer, and a flowchart illustrates how the five program modules control the system.

Later chapters more fully examine each piece of equipment, particularly those that cannot be purchased, and include a number of schematics for various circuits, relays, and switches. These chapters, however, are much too brief for readers with no electronics experience—they'll have to look elsewhere for information to fill in the gaps. The discussion of the interrupt system, for example, assumes the reader has enough background to decipher this passage:

> *All the inputs are sent to the input port. They are also functionally ORed together using a NAND gate and an inverter. If any switch is closed, the 555 monostable multivibrator will be triggered. It will produce a short pulse, which is inverted again and sent to the Apple's interrupt line.*

Similarly, the discussions of components such as the driver circuit, the clock, and other equipment that must be built will seem far too terse to those with little electronics background. Also, although the Speech Link voice-recognition unit that the author selected for his home-control system is no longer being manufactured, the chapter on voice-recognition discusses the specifics of this particular piece of equipment. The author says it's easy to interface almost any other unit to the Apple, but it would have been more helpful if the discussion had been tailored to currently available hardware.

Software Control

The chapter that presents an overview of the software (which is included as listings in appendixes) stresses the importance of understanding how the programs control the system. The structure is easy to understand, consisting of an initialization module and five main programs. Control is continually passed from one module to the next until a signal indicates some situation that requires the computer to respond. The sequential loop is normally completed so quickly that the system appears to be monitoring all five modules simultaneously. A number of safeguards are built into the software so that, for example, the computer does not ignore an intruder while it's answering the phone or turning lights on or off.

More detailed chapters explain the principles of structured programming and show flowcharts of the major program modules and subroutines in each module. The program modules and subroutines call up a number of different tasks, such as dialing the phone, recognizing a spoken word, pausing for a given number of seconds, and pushing a button on the BSR Command Console. By combining these tasks in different ways, each module and subroutine performs a specified action.

Generally, the chapters discussing the software are well organized and easy to follow. Most of the program modules are written in BASIC. The program that monitors the movement of people throughout the house is written in machine language, but even readers who are unfamiliar with programming should have no trouble following the discussion. For those who don't want to type in the programs, a ready-to-run disk is available from the author for $12.50.

If you don't want to tackle the entire home-control system right away, you can easily do some customizing. You could, for instance, initially set up a system that simply turns a few lights on and off when you're away. On the other hand, you might want to enhance Blankenship's system by adding, say, a smoke detector or a doorbell sensor. Because the system is modular, you can adapt it easily by adding or subtracting hardware and rewriting parts of the software.

Blankenship's excitement and enthusiasm for the computerized home comes through loud and strong. He even attempts to convince you that as the project proceeds, you'll begin to talk to your house as if it had a personality of its own. But in his enthusiasm, he sometimes makes computerized home control sound a bit too simple. It's a big project that takes work, money, and, like many home projects, probably far more time than you'd expect. But just reading *The Apple House* will help you decide if you want to get involved in computerized home control and help you narrow down exactly what you want the computer to do. With this book, you might not find the friendship that the author developed with his house, but you might begin to make your life a little easier.

MICRO REVIEWS

by Mike Nicita and Ron Petrusha

Introduction to the Lisa

by Arthur Naiman
Addison-Wesley, Reading, MA, 1984, 200 pages, softcover $9.95

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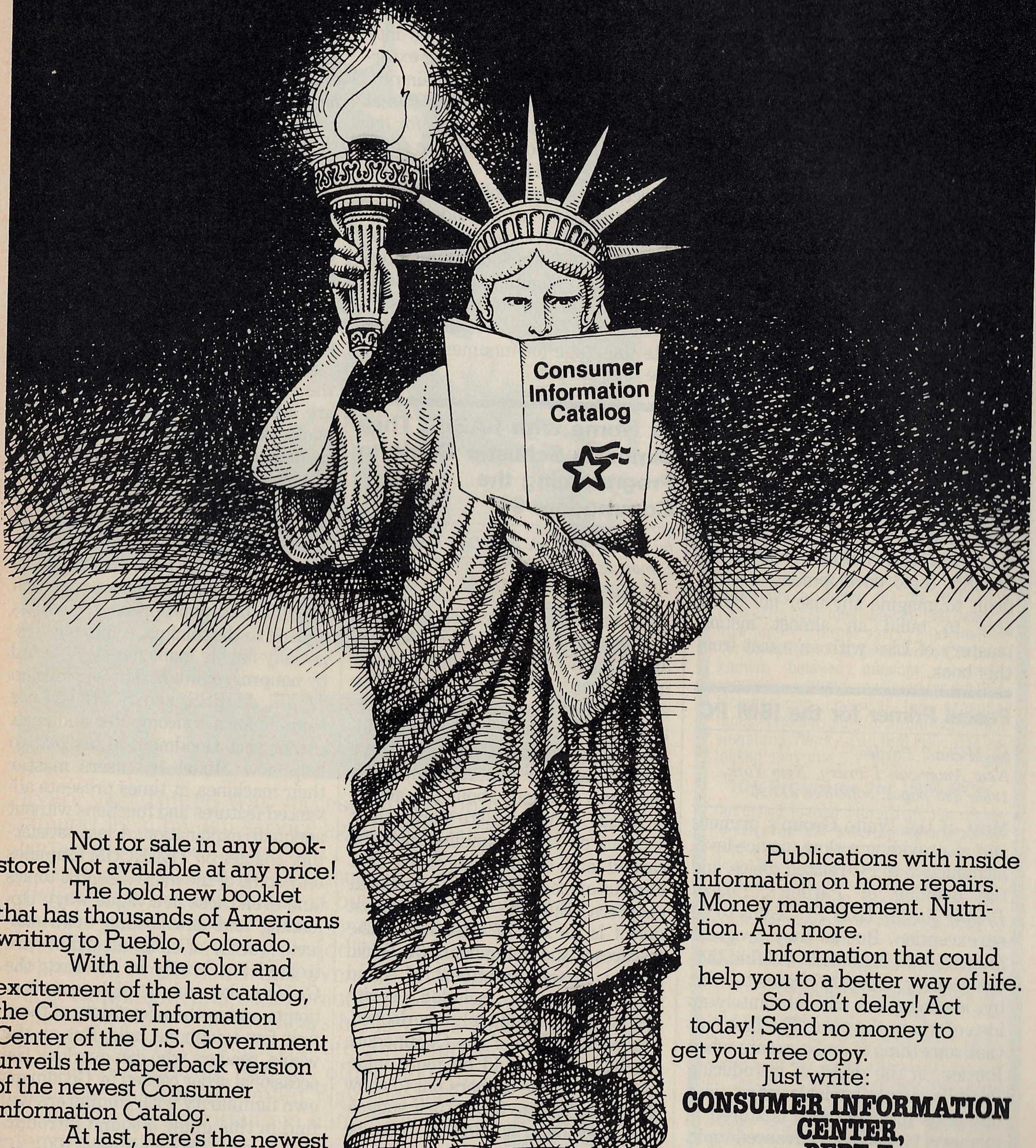

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is such a refreshingly concise, effective work. The first is readily apparent just by leafing through its pages—the author has used the bit-mapping capabilities of the Lisa to produce his own reproductions of Lisa screens. Not only are these dot-matrix "dumps" of monitor displays amazing in their own right as a demonstration of printing precision graphics, but they also supplement the text better than any artist's renderings could. The second key component of the book's unqualified success is one that many readers first experienced with Naiman's *Introduction to Wordstar*. His expertise and humorous cynicism make for lively, entertaining reading. The structure of the book is very simple. Naiman discusses Lisa software and hardware and then walks through each of the most important Lisa applications: Lisawrite, Lisalist, Lisacalc, Lisagraph, Lisaproject, Lisadraw, and Lisaterminal. Given what has been described as software "that makes you feel that it cares about you" and Naiman's own reader-friendly topic development, it's difficult to imagine any user not being able to build an almost instant mastery of Lisa with an assist from this book.

Pascal Primer for the IBM PC

by Michael Pardee
New American Library, New York, 1984, 293 pages, softcover $17.95

Most of the Waite Group's primers aim at providing a slow, novice-level introduction to PC-related topics, and the opening of Pardee's *Pascal Primer for the IBM PC* seems to be no exception. But as they progress into the text, beginners will find that the scenery abruptly begins to whiz by, leaving them with absolutely no idea of where they are. The first hint that something is amiss occurs when Pardee, in the midst of introducing Pascal's simple variable types, also discusses the way data is stored in memory, typically an advanced topic. As Pardee warms to his subject, the text grows shorter, explanations begin to disappear altogether or to emerge in unexpected places, and sample programs begin to play a greater role in highlighting IBM Pascal's features. Pardee even introduces such advanced topics as linking assembly-language subroutines into Pascal programs and including external library subroutines in a main program. For users familiar with Pascal programming, *Pascal Primer for the IBM PC* can variously serve as an introduction to IBM's own Pascal dialect, as a sourcebook of invaluable subroutines, or as a guide to advanced topics. For each of these purposes, Pardee's work offers an interesting and enlightening treatment. But for those without the necessary background, *Pascal Primer* at best sets the stage for innumerable compile-time errors.

At Home with BASIC: The Simon & Schuster Guide to Programming the Commodore 64

by Henry Mullish and Dov Kruger
Simon & Schuster, New York, 1984, 192 pages, softcover $11.95

Long after the publication of James Coan's classic *Basic BASIC*, Mullish and Kruger have been able to do no more than clone his work. The authors' focus on BASIC for mathematical applications leads them to introduce string variables for the first time in chapter six. And although they wax eloquent about the ability of BASIC to manipulate words, their sections on string handling lack the careful and detailed approach that characterizes the mathematical chapters. But the book's greatest defect is its lack of attention to the features of the Commodore 64. While a very cursory treatment of sound programming is included, sprite graphics are completely overlooked. The examination of the Commodore BASIC editor could be more informative. And the authors fail to show the reader how to follow their suggestion that lines of BASIC code be "pretty-printed." Commodore 64 owners interested almost exclusively in mathematical applications will find *At Home with BASIC* a sound introduction to programming. This narrow focus, however, will be a source of disappointment for those with broader interests.

The Simon & Schuster Guide to the TRS-80 Model 100

by Danny Goodman
Simon & Schuster, New York, 1984, 240 pages, softcover $9.95

The TRS-80 Model 100's portability and integration of five different software packages make it of interest above all to nonprogrammers on the move. Goodman has largely succeeded in reflecting the interests of this professional, nontechnical audience. This guide to the TRS-80 Model 100 and the NEC PC-8201A (both of which are actually the focus of Goodman's book) does a good job of allowing readers to decide which of the two machines is best suited to their needs, but without helping to determine whether this particular species of "portable" is most appropriate. The remainder of the book treats Model 100 software. Goodman does not teach BASIC, but appropriately confines himself to the minimal commands (especially for file management) needed by nonprogrammers. The sections on TEXT, ADRSS, and SCHEDL are suitable for a noncomputer audience, except that Goodman, in his zeal to help new Model 100 users master their machines, at times presents advanced features and functions without adequate explanation. A less satisfactory chapter on TELECOM examines only some of the more essential topics (and even these in a vague way). Uploading and downloading—two subjects worthy of some attention—are treated but briefly in the text; the *Guide* makes only a slight contribution to easing the uncertainty of those first few telephone calls. But on the whole, readers who can overlook the occasional ardor caused by Goodman's own familiarity with computers will find in this guide a sound introduction to the TRS-80 Model 100. □

Mike Nicita and Ron Petrusha are coauthors of *The Reader's Guide to Microcomputer Books* (Golden-Lee, 1983).

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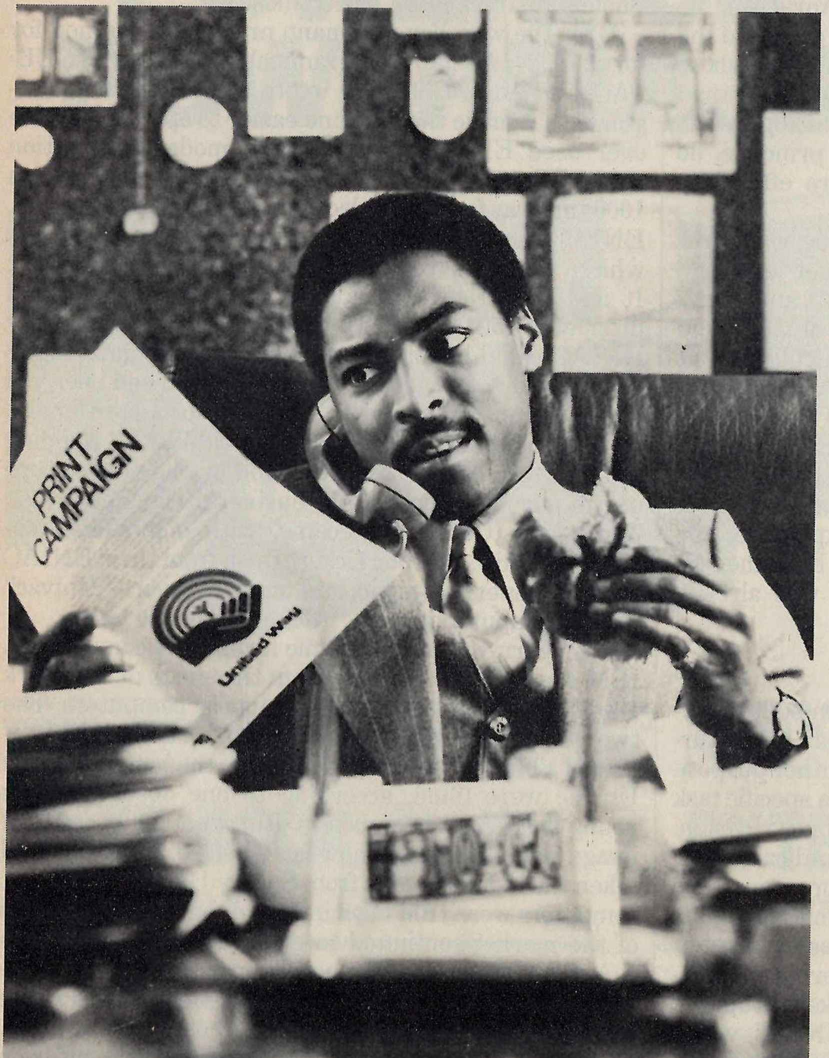

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fessor of mathematics and physics at Iowa State College, saw how electronics could replace the relays. Shortly before the American entry into World War II, Atanasoff, with the help of Clifford Berry, designed the ABC, the Atanasoff-Berry Computer, a computer whose switching units were to be vacuum tubes rather than relays. This switch was an important technological advance. Vacuum tube machines could, in principle, do calculations considerably faster and more efficiently than relay machines.

The ABC, like Babbage's Analytical Engine, was never completed, probably because Atanasoff got less than $7000 in grant money to build it. Atanasoff and Berry did assemble a simple prototype, a mass of wires and tubes that resembled a primitive desk calculator. But by using tubes as switching elements, Atanasoff advanced the development of the computer. The efficiency of tubes would make the computer a practical possibility.

By the first third of the 20th century the advent of computing machines was obvious. What also seemed obvious was that they would be huge, expensive, and special-purpose devices. It took decades to belie the first two of those assumptions, but the last was already doomed.

Turing's Radical Theory

Until the 1930s, machines had always been built to perform a special task; British mathematician Alan Turing envisioned a machine designed for no other purpose than to read coded instructions *describing* a specific task and to follow the instructions to complete its own design. Within approximately a decade, Turing's radical theory became reality. The instructions became programs, and his concept, in the hands of another mathematician, John Von Neumann, became the general-purpose computer.

In 1943, at the Moore School of Engineering in Philadelphia, John Mauchly and J. Presper Eckert proposed and began supervising the building of ENIAC, which was to be the first all-electronic digital computer. ENIAC, with the exception of the peripheral machinery needed to get information in and out, was a pure vacuum tube machine, apparently based in part on ideas Mauchly got from a visit to Atanasoff. Mauchly and Eckert attracted to the project a number of bright mathematicians, including one brilliant mathematician named John Von Neumann.

Von Neumann got involved with the Moore School work and made various—and variously reported—contributions to ENIAC, but he also offered an outline for a more sophisticated machine called EDVAC. Von Neumann swung the emphasis at the Moore School from technology toward logic. He saw EDVAC as more than a calculating device: it could perform logical as well as arithmetic operations, it operated on coded symbols, and its instructions for operating on—and for interpreting—the symbols could themselves be symbols coded into the machine and operated on. This was the last fundamental insight in the logical development of the modern computer. By specifying that EDVAC should be programmable by instructions themselves fed in as data, Von Neumann created the specifications for the general-purpose computer. His EDVAC realized Turing's and Boole's abstract ideas electronically.

After the war, Von Neumann proposed a method for turning ENIAC into a programmable computer like EDVAC, and Adele Goldstine wrote the 55-operation language that made the machine easier to operate. No one ever used ENIAC in its original mode of operation again. When ENIAC was finished in early 1946, it ran 1000 times as fast as its electromechanical counterparts. ENIAC was a roomful of clanking teletype machines, whirring tape drives, and walls of electronic circuitry. It had 20,000 switching units, weighed 30 tons, and dissipated 150,000 watts of energy. With all this power ENIAC could handle 20 numbers of 10 decimal digits each. Even before its completion ENIAC had been put to significant use doing calculations for Los Alamos.

A new industry emerged from World War II. Building computers became a business, and by the very nature of the machines, it was big business. The Remington Typewriter Company became, with engineers John Mauchly and J. Presper Eckert fresh from their ENIAC triumph, Sperry Univac, and for a few years "Univac" meant computer just as "Kleenex" meant tissue.

But Sperry Univac has some formidable competition. IBM executives recovered from the shock of the Mark 1 and began building general-purpose computers. The two companies developed distinctive styles; IBM acquired a blue pin-stripe image, while the halls of Sperry Univac were filled, according to one observer, with young academics in sneakers. But whether because of image or managerial know-how, before long IBM had taken the industry away from Sperry Univac. Soon most computers were IBM machines, and the company's share of the market continued to grow.

And the market continued to grow too. Other companies developed, and they were generally under the guidance of engineers who left IBM or Sperry Univac. Control Data Corporation in Minneapolis spun off from IBM, and soon there were Honeywell and Burroughs, General Electric, RCA, and NCR. Collectively, these companies were to own the large-computer market a decade or so later, but with IBM so far ahead of the others in revenues, they were often referred to as Snow White (IBM) and the Seven Dwarfs.

But IBM and the others were manufacturing "dinosaurs." A new kind of computer emerged in the 1960s. This machine was smaller and cheaper and was named, in imitation of the popular miniskirt, the minicomputer. Among the most significant companies producing smaller computers were Digital Equipment Corporation (DEC) in the Boston area and Hewlett-Packard (HP) in Palo Alto, California.

The computers these companies were building were all general-purpose machines in the Turing-Von Neumann sense, and the computers were getting more compact, more efficient, and more powerful. Soon, however, a technological breakthrough would allow startling advances in power, efficiency, and miniaturization.

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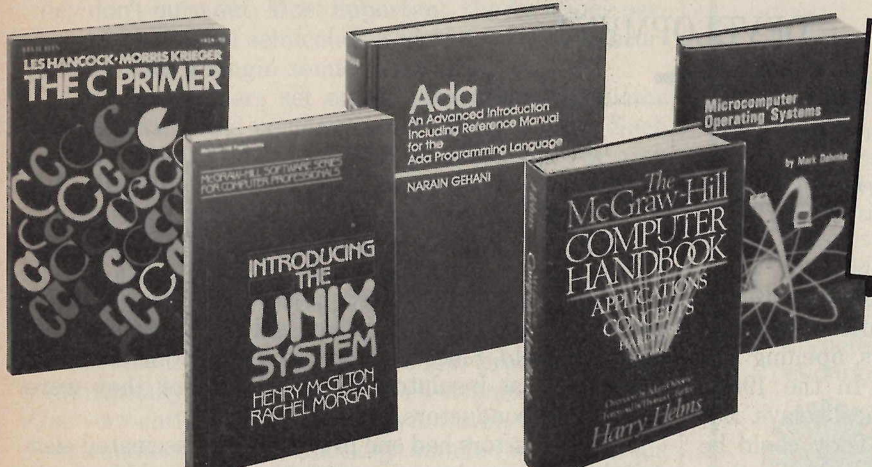
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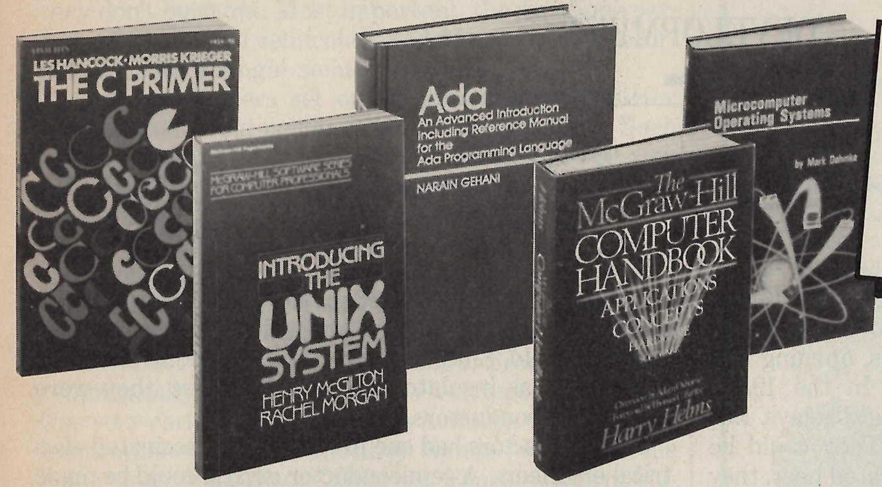
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THE INVENTION OF THE TRANSISTOR REVOLUTIONIZED COMPUTER DEVELOPMENT

Inventing the transistor meant the fulfillment of a dream; almost the perpetuum mobile.
Ernest Braun and Stuart MacDonald
(*Revolution in Miniature*, 1978)

The Breakthrough

IN THE 1940s, the switching units in computers were mechanical relays, opening and closing, clattering like freight trains. In the 1950s, vacuum tubes took the place of mechanical relays. But tubes were a technological dead end. They could be made only so small, and since they generated heat, they could be placed only so close to one another. As a result, tubes afflicted the early computers with a kind of technological elephantiasis. But by 1960, physicists working with solid-state elements had introduced an entirely different mechanism into the field.

The device that consigned the vacuum tube and magnetic core to the back-alley bin was the transistor, a tiny, seemingly inert slice of crystal with interesting electrical properties. The transistor was recognized almost immediately as a revolutionary development. Many scientists feel that the transistor is the only significant *scientific* advance embodied in the computers that are so omnipresent today. John Bardeen, Walter Brattain, and William Shockley shared the Nobel Prize in physics in 1956 for their work on the invention.

The transistor had more significance than the mere obsolescence of another bit of technology. This device, the result of a series of developments in the applications of quantum physics, changed the computer from a "giant electronic brain" in the exclusive domain of engineers and scientists to a commodity like a television set. The transistor was the technological breakthrough that brought forth the minicomputers of the 1960s and made possible the personal computer revolution of the 1970s.

Actually, Bardeen and Brattain made the breakthrough that has been called "the major invention of the century" in 1947, two days before Christmas. But understanding the significance of the device that came into existence in Murray Hill, New Jersey, that winter requires looking even farther back in time.

In the 1940s, Bardeen and Shockley had both been working in an apparently unrelated field. Quantum physics has made certain odd predictions about the electrical behavior of crystals, and some physicists were intrigued by the distinctive behavior that crystals of elements such as germanium and silicon displayed in an electrical field. Since the crystals could not be classified electrically as insulators or as conductors, they were called semiconductors.

Semiconductors had one property that fascinated electrical engineers. A semiconductor crystal could be made to act as a conductor for electrical current passing through it in one direction but not in the other. Engineers had put this discovery to practical uses. Tiny slivers of such crystals were used to rectify electrical current, that is, to turn alternating current into direct current. Early radios, called crystal sets, were the first commercial products to use these crystal rectifiers.

The crystal rectifier was a curious device. With no moving parts, it was incapable of doing more than merely rectifying a current. A different device soon replaced it almost entirely. This item was Lee DeForest's triode, the vacuum tube that made radios glow. The triode was much more versatile than the crystal rectifier. It could amplify current passing through it and use a weak secondary current to alter a strong current passing from one of its poles to another. This ability to change one current by means of another, effectively a signal, was essential to an EDVAC-type computer design. At the time, though, some researchers felt the triode's main importance lay in telephone switching circuits.

Shockley was working for Bell Labs and was interested, as were other researchers, in a particular area of semiconductor research: the effect of impurities in the semiconductor crystals. These impurities, trace amounts of some other substance, could provide the extra electrons needed to carry current. Shockley convinced Bell Labs to let him put together a team to study the effect. He was convinced he could create a solid-state amplifier. His team consisted of experimentalist Walter Brattain and, in 1945, theoretician John Bardeen. For some time the group's efforts got nowhere. Similar research was underway at Purdue University, and the Bell group closely observed the work there.

Bardeen finally solved the puzzle. An inhibiting effect on the surface of the crystal, he said, was interfering with the flow of current. Brattain conducted the experiment that proved Bardeen right, and on December 23, 1947, the transistor was born.

The transistor did everything the vacuum tube did, and it did it better. Semiconductor devices have a number of properties that make them preferable to tubes. They are smaller, they don't generate as much heat, and they don't burn out. Most important, the functions performed by several semiconductor devices can be incorporated into a single semiconductor sliver.

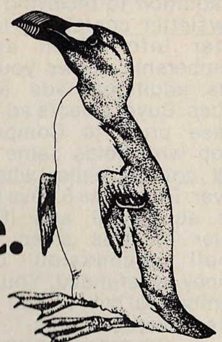
Next, researchers set out to create semiconductor devices that could perform more complex tasks. Such devices integrated a number of transistors—or tiny features about as complex as transistors—into a more complex circuit and were therefore called integrated circuits, or ICs. Since physically they were only tiny chips of silicon, they also came to be called chips.

Creating the chips was a complicated and expensive process and generated an entire industry. The first semiconductor corporations to begin producing chips commercially were the existing electronics companies. One very early start-up company, however, was Shockley Semiconductor, which Shockley founded in 1955 in his home town, Palo Alto, California. Shockley's firm employed many of the best semiconductor people in the world at the time.

Those people didn't all stay with the company. Shockley Semiconductor spawned Fairchild Semiconductor, and Fairchild spawned a number of other companies. A decade after Fairchild was formed, virtually every semiconductor company in existence could boast a large number of former Fairchild employees. Even the big electronics companies that entered the semiconductor industry in the 1960s, such as Motorola, employed ex-Fairchild engineers. And with some large exceptions—like Motorola, Texas Instruments, and RCA—most of the semiconductor companies were located within a few miles of Shockley's operation in Palo Alto, in the Santa Clara Valley. Since by this time nearly all semiconductors were made of silicon, the area became known as Silicon Valley.

The semiconductor industry grew with amazing speed, and the size and price of its products shrank at the same pace. Competition was fierce. At first there was little demand for highly complex ICs outside the military and aerospace industries. Certain kinds of ICs were in common use in large, so-called mainframe computers and minicomputers, especially as memory chips—semiconductor devices that could retain data as long as power was applied to them. Other chips did not retain the data flowing through them, but changed it in assigned ways. There were chips that performed arithmetic operations and logic operations. The densest were the memory chips with hundreds of transistors apiece. But in the early 1970s, the runaway demand for electronic calculators provided semiconductor manufacturers with a market for a new and more complex kind of chip. □

Next month: the conclusion of Chapter 1.



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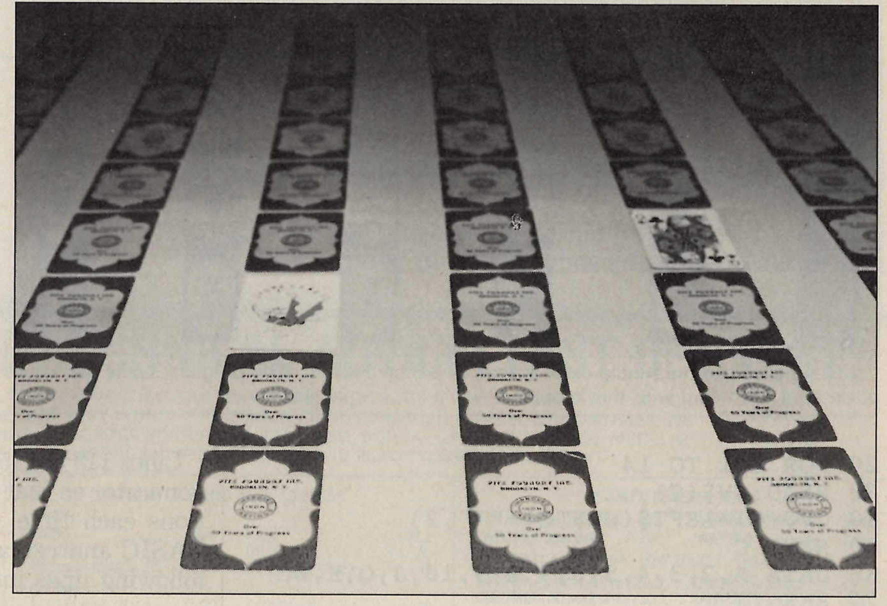
Concentration

Play this traditional card game on your computer

by George Stewart



For years, children have been playing the card game Concentration. During the '50s the game took to TV, and millions of viewers tuned in each day to compete against TV contestants. Taking the game one step further, this month's program lets you play Concentration with your computer. Don't think about how many decks of cards you can buy for the price of a computer, and don't expect the computer to come close to replacing the enthusiasm of TV host Hugh Downs. But the computer version has unique advantages over its predecessors, such as automatic scoring, shuffling, and card handling.

Rules of the Game

One or more persons can play Concentration, although two players are usually best. Players shuffle a deck of cards and then arrange them facedown on a table. For a 54-card deck (including two wild cards), a 6 by 9 layout is recommended, as shown on page 198.

The first player turns over two cards. If the cards match (two aces, for example) or if either of the cards is a wild card, the player takes the cards and puts them in his stack. Otherwise, the player turns the cards facedown again, leaving each in its original position on the table. Play then passes to the next player. The game continues until all cards have been matched up and none remain on the table. The player with the most cards in his stack wins.

The key to winning is to remember the location and identity of the cards that have been revealed, so that you can find them again to complete a matching pair.

In the computer version of Concentration, the object and rules of the game are the same. The computer displays a 6 by 9 layout of Xs, representing a 54-card deck. One to four people can play; if only one person plays, that person takes each consecutive turn—the computer does not take alternate turns.

The Program

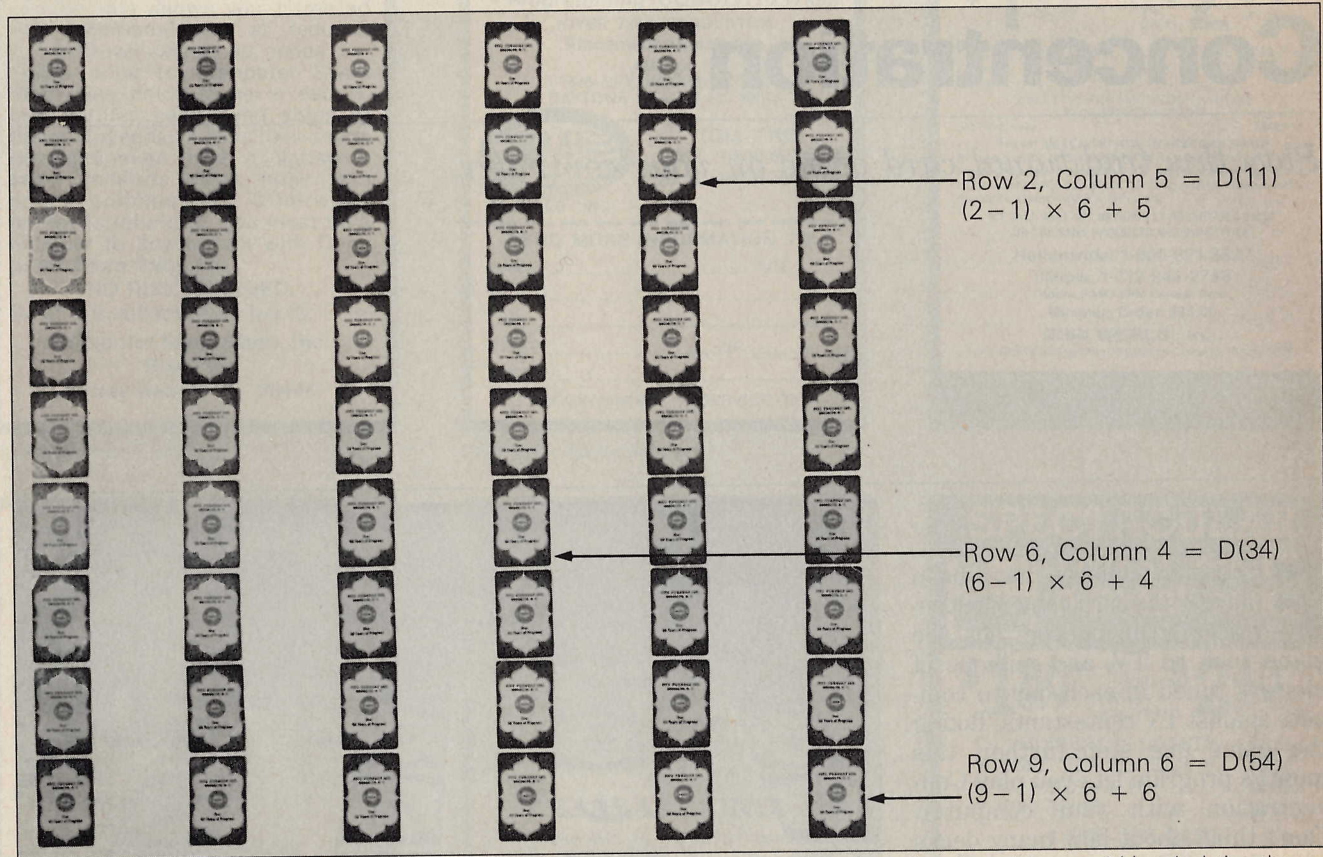
The program is written in Microsoft BASIC and should run with little or no modification on most personal computers. Where language differences are likely to cause problems, we offer alternate lines (highlighted in gray) for various computers. Use these lines only if you're sure you need them; look up the relevant commands in your BASIC manual if you're uncertain.

We present the program in logical blocks. Type them in as you read along. The first block sets up several arrays and constants:

```
10 DIM PN$(4), SC(4), CV$(14), D(54),
     CN(2)
```

George Stewart is a contributing editor of *Popular Computing.*

Photograph by Ed Crabtree



Cards are arranged on a table or on screen in a 6 by 9 layout. The program stores the values of each card in array D( ), calculating the position of each card with the formula (R − 1) × 6 + c as shown.

```
20 FOR C=1 TO 14
30 READ CV$(C)
40 CV$(C)=LEFT$(CV$(C)+" ",2)
50 NEXT C
60 DATA A,2,3,4,5,6,7,8,9,10,J,Q,K,WC
70 BK$="X"
80 NC$="."
90 WC=14
100 M2$="  ": REM 2 spaces in quotes
110 M3$="   ": REM 3 spaces in quotes
113 INPUT "ENTER A RANDOM NUMBER ";X
115 X=RND(-ABS(X))
```

PN$( ) stores the names of up to four players and SC( ) stores their scores. CV$ stores the 14 names or "indexes" of the playing cards: A (ace), 2, 3, . . . 10, J (jack), Q (queen), K (king), and WC (wild card). D( ) contains the 6 by 9 layout of the 54 cards. CN( ) stores the locations of the two cards currently under examination.

Lines 20 to 60 read in all 14 card indexes, insuring that each name is two characters long (line 40).

BK$ represents a facedown card, and NC$ represents an empty position (the card has been removed already). WC indicates a wild card. M2$ and M3$ contain two and three spaces respectively and are used to provide uniform spacing between rows and columns when the computer displays the card layout.

Lines 113 to 115 reset the computer's random number generator so that the cards are placed in different positions each time you run the program. For IBM PC BASIC and certain other versions of BASIC, use the following lines instead:

```
113 REM Reset random number generator
115 RANDOMIZE
```

The next block of lines starts the game:

```
120 CLS: REM Clear the screen
130 PRINT "CONCENTRATION"
140 PRINT
150 INPUT "Number of players (1-4) ";PX
160 IF PX<1 OR PX>4 THEN 140
170 FOR PN=1 TO PX
180 PN$(PN)="": REM  No spaces inside
    quotes
190 PRINT"Name of player "; PN
200 INPUT PN$(PN)
210 IF PN$(PN)="" THEN PN$(PN)="PLAYER
    "+STR$(PN)
220 SC(PN)=0
230 NEXT PN
```

Line 120 clears the screen. Instead of CLS, your computer might use another command. In Applesoft

BASIC, use this alternate line:

```
120 HOME
```

In Commodore 64 BASIC, use

```
120 PRINT CHR$(147);
```

Lines 170 to 230 get the names of all the players. If a player presses Return or Enter without typing in his name, line 210 stores the name PLAYER *n*, substituting the appropriate number 1 to 4 for *n*. Line 220 sets each player's score to 0.

The next block of lines arranges the cards at random in a 6 by 9 pattern but does not show the layout on the screen:

```
240 FOR C=1 TO 54
250 D(C)=0
260 NEXT C
270 FOR W=1 TO 2
280 FV=14
290 C=INT(RND(1)*54+1)
300 IF D(C)>0 THEN 290
310 D(C)=FV
320 NEXT W
330 FOR N=1 TO 52
340 C=INT(RND(1)*54+1)
350 IF D(C)>0 THEN 340
360 D(C)=N-INT(N/13)*13+1
370 NEXT N
380 CL=54
390 PN=1
```

The program stores the value of each card in the array D( ); card position row R, column C corresponds to array element (R − 1) × 6 + C, as illustrated on page 198. Lines 240 to 260 set every array element to 0, which indicates that no card has been assigned to any location. Lines 270 to 320 place the two wild cards. The RND function in line 290 selects a random value greater than or equal to 0 and less than 1. The value is then scaled to the range of 1 to 54. In IBM PC BASIC, use this line instead:

```
290 C=INT(RND*54+1)
```

Lines 330 to 370 place the remaining 52 cards into the 6 by 9 arrangement. Line 340 serves the same function as line 290. In IBM PC BASIC, use:

```
340 C=INT(RND*54+1)
```

Line 360 converts N (which ranges from 1 to 52) into a value from 1 to 13, corresponding to the 13 remaining

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Circle 23 on inquiry card.

card indexes (ace, 2, 3, . . . king), and stores that value in the randomly selected location C.

CL stores the number of cards left on the table after players have begun to match up and remove cards. In line 380, CL=54 because no cards have been removed yet. Line 390 gives the first turn to player 1.

The next lines start a player's turn:

```
400 CN(1)=0
410 CN(2)=0
420 FOR C=1 TO 2
430 GOSUB 950
440 PRINT
450 PRINT PN$(PN) " select card # ";C
460 INPUT "(specify row and column
    numbers) ";RO,CO
470 RO=INT(RO)
480 CO=INT(CO)
```

Line 420 sets up a loop (lines that are repeated) in which the player selects two cards. Before each card selection, the subroutine called in line 430 erases the screen and shows the card layout. Lines 450 and 460 prompt the player to select a card by typing in its row and column location.

The next block of lines ensures that the selection is valid:

```
490 IF RO>=1 AND RO<=9 AND CO>=1 AND
    CO<=6 THEN 530
500 PRINT "Error: choose ROW=(1-9)
    COLUMN=(1-6)"
510 GOSUB 1100
520 GOTO 430
530 CR=(RO-1)*6+CO
540 IF C=2 AND CR=CN(1) THEN 590
550 IF D(CR)>0 THEN 620
560 PRINT "That card is not available"
570 GOSUB 1100
580 GOTO 430
590 PRINT "You just took that card"
600 GOSUB 1100
610 GOTO 430
620 CN(C)=CR
630 NEXT C
```

These lines check for three types of errors: invalid row-column address (lines 490 to 520); reference to an empty position (lines 530 to 580); and a request for the same card for card 1 and card 2 (lines 590 to 610). If any of these errors occurs, the subroutine called in lines 510, 570, and 600 prompts the player to press Return before making a new selection.

If the selection is valid, line 620 stores it in CN(C), where C equals 1 or 2. Line 630 repeats the card-selection loop until the player has selected two cards.

The next block of lines checks the player's pair to see if the cards match:

```
640 GOSUB 950
650 IF D(CN(1))=D(CN(2)) OR D(CN(1))=WC
    OR D(CN(2))=WC THEN 680
660 PRINT "No match"
670 GOTO 740
680 PRINT "Match"
690 D(CN(1))=0
700 D(CN(2))=0
710 SC(PN)=SC(PN)+2
720 CL=CL-2
730 IF CL=0 THEN 820
```

Line 640 clears the screen and shows the layout with the latest pair faceup. Line 650 determines if the cards match or if one of them is a wild card. In case of a match or wild card, lines 690 and 700 remove the two cards from the layout, and line 710 adds 2 to the player's score. Line 720 updates the counter that keeps track of the number of cards remaining. If CL=0, no cards remain and the program skips to the new-game menu described later. Otherwise, the program displays a continuation menu:

```
740 GOSUB 1100
750 PN=PN+1
760 IF PN<=PX THEN 810
770 PN=1
780 PRINT
790 GOSUB 900
800 GOSUB 1100
810 GOTO 400
```

The subroutine called in line 740 waits until a player presses Return. Lines 750 to 770 select the next player. At the end of each round, the subroutine in line 790 shows the current scores.

When all cards have been matched up and removed, the game is over. The next block prints a new-game menu:

```
820 PRINT
830 PRINT "No cards left -- game over"
840 PRINT
850 GOSUB 900
860 PRINT
870 INPUT "Play again? (Y/N) ";YN$
880 IF LEFT$(YN$,1)="Y" THEN 120
890 END
```

Subroutines

The program uses three subroutines. The first displays the current scores:

```
900 PRINT "Scores are:"
910 FOR P1=1 TO PX
920 PRINT PN$(P1),SC(P1)
930 NEXT P1
940 RETURN
```

The next subroutine displays the current card layout:

```
950 CLS: REM Clear the screen
960 FOR CQ=1 TO 54
970 IF D(CQ)>0 THEN 1000
980 PRINT NC$;M3$;
990 GOTO 1070
```

```
1000 IF CQ=CN(1) OR CQ=CN(2) THEN 1030
1010 PRINT BK$;M3$;
1020 GOTO 1070
1030 REM Reverse colors
1040 PRINT CV$(D(CQ));
1050 REM Normal colors
1060 PRINT M2$;
1070 IF CQ-INT(CQ/6)*6=0 THEN PRINT
1080 NEXT CQ
1090 RETURN
```

Line 950 clears the screen so the current player won't have any help from previous displays. In Applesoft BASIC, use this line:

```
950 HOME
```

In Commodore 64 BASIC, use:

```
950 PRINT CHR$(147);
```

The loop in lines 960 to 1080 handles all 54 card positions in the layout. CQ is the current card position.

There are three possibilities for each card position: empty; facedown; or faceup (for the two currently selected cards). Line 980 handles empty card positions, line 1010 handles facedown cards, and lines 1030 to 1060 handle the two faceup cards. Line 1070 causes the program to start a new row after displaying six cards in a row.

Reverse printing makes it easier to spot the currently selected cards. If your computer can print letters in reverse, replace the remarks in lines 1030 and 1050 with the appropriate commands.

In Applesoft BASIC, use:

```
1030 INVERSE
1050 NORMAL
```

In IBM PC BASIC, use:

```
1030 COLOR background, foreground
1050 COLOR foreground, background
```

replacing the italicized words with the appropriate foreground and background color numbers.

On many other computers, you can use:

```
1030 PRINT CHR$(reverse);
1050 PRINT CHR$(normal);
```

The PRINT command is followed by the appropriate video control codes that determine whether a character

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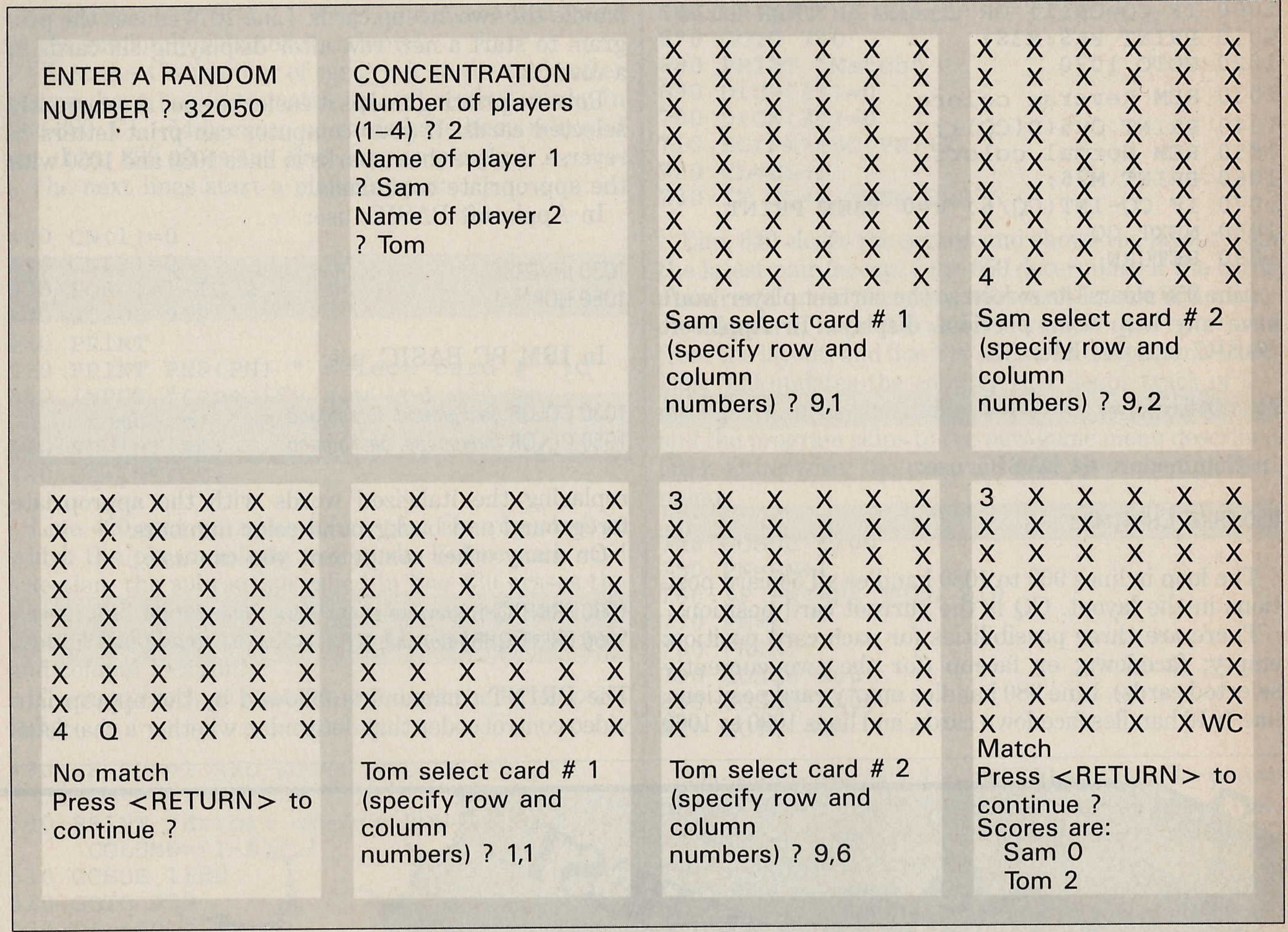
Circle 19 on inquiry card.



```
ENTER A RANDOM
NUMBER ? 32050
```

```
CONCENTRATION
Number of players
(1-4) ? 2
Name of player 1
? Sam
Name of player 2
? Tom
```

```
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
Sam select card # 1
(specify row and
column
numbers) ? 9,1
```

```
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
4 X X X X X
Sam select card # 2
(specify row and
column
numbers) ? 9,2
```

```
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
4 Q X X X X
No match
Press <RETURN> to
continue ?
```

```
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
Tom select card # 1
(specify row and
column
numbers) ? 1,1
```

```
3 X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
Tom select card # 2
(specify row and
column
numbers) ? 9,6
```

```
3 X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X X
X X X X X WC
Match
Press <RETURN> to
continue ?
Scores are:
 Sam 0
 Tom 2
```

When the program is running properly, your computer should display results similar to these. The sample run illustrated here shows only the first turn of each player; the game continues, of course, until all cards are matched up.

is normal or reverse. Check your computer's BASIC reference manual to find the video control codes you should use.

If your computer can't print the selected cards in reverse, leave lines 1030 and 1050 as remarks. You'll still be able to find the faceup cards by looking for the card numbers and letters (A,2,3,. . .J,Q,K) displayed normally in the layout.

The last subroutine simply waits for a player to press Return (Enter on some computers) to continue the game:

```
1100 PRINT
1110 INPUT "Press <RETURN> to continue
     ";RT$
1120 RETURN
```

Using the Program

The figure above shows a sample run of Concentration. You should get similar results with the program on your computer.

The game must be played without pencil or paper. For fairness, everyone should get a look at the screen after each player completes his turn (and before he presses Return). However, sometimes players have unevenly matched skills. In these cases you can even the odds by letting the better player see the screen only for his turn. □

Do you have questions regarding this program or suggestions for future projects? Send them to: George Stewart, The Program Factory, R.F.D. #1, Box 802, Hancock, NH 03449. Include a stamped, self-addressed envelope if you want a reply. For programming questions, include a program listing, a sample run, and a brief description of your problem.

Editor's Note: George Stewart's book *The Apple Program Factory* (Osborne/McGraw-Hill, 1984, $11.95) is a collection of 20 programming projects, most of which have appeared in these pages. All of the programs are written specifically for computers with Applesoft BASIC and make use of features like graphics, disk files, and sound. Other Program Factory books are on the way as well, including collections for the Commodore 64, IBM PC, and TRS-80 computers.

ASK POPULAR

After accessing the disk drives on my Zenith Z-100 computer, I notice that the drives continue to rotate for about 10 seconds. Can I safely remove my disks during this time? **–Yui Yee**
Los Angeles, CA

Yes. The 10-second lag before the drive stops spinning is designed to minimize the number of times the disk drive starts and stops during data transfers—the drive does not have to start again for a second access within 10 seconds of the first. However, opening the drive door during the lag will lift the read/write head, allowing you to remove or insert the disk without damage. If you see the system prompt character on your screen, you know that no data is being written to the disk and it's safe to remove it.

It seems that all microcomputers have operating systems and BASIC in ROM. Do you know of any that have them on disk? **–Leigh Janes**
Montezuma, NY

Actually, most microcomputer operating systems are on disk rather than in ROM (read-only memory). The ROM usually contains the software that loads the operating system into memory, but the actual system commands come from the disk. Most disk-based operating systems include in their names the acronym DOS, which stands for disk operating system.

One of the advantages of a disk operating system is its expandability. Because such systems include external, or *transient*, commands that reside on disk and are loaded into memory before execution, additional commands can be created and added to the operating system environment as needed. The .COM files in IBM's PC-DOS are examples of external commands.

Some of today's less expensive microcomputers feature BASIC in ROM because it facilitates programming on a minimal system. More powerful computers typically don't have BASIC in ROM because users may prefer other programming languages, such as Pascal, COBOL, or FORTRAN. Some computers—the IBM PC and the Radio Shack TRS-80 Model III, for example—have a ROM BASIC that can be upgraded with optional disk BASIC to include disk-based commands and advanced programming features.

I have an Apple II Plus with an Apple Monitor III and Apple dot-matrix printer. The monitor will display only 40 columns when I'm using the Apple Writer II word-processing program or when I'm programming. Also, my printer will output program lines only 40 columns wide, although it will print 80 columns of text from the word processor. What do I need to display 80 columns on the monitor and print 80-column program lines? **–Jerry Bunin**
Grover City, CA

The Apple II Plus, as well as other computers designed for use with a standard television set, limits displayed lines to 40 characters because televisions haven't the resolution to display 80-character lines clearly. This is controlled by internal software routines and cannot be changed by the flick of a switch. However, either of two methods will give you an 80-column word-processing display.

First, you can install one of the 80-column display cards designed for the Apple. These normally plug into expansion slot 3 and give you upper- and lowercase characters as well as the 80-column width. Such cards for the Apple include Videoterm 80 ($279), from Videx, 1105 Northeast Circle Blvd., Corvallis, OR 97330, (503) 758-0521; Viewmaster 80 ($179), from Applied Engineering, POB 798, Carrollton, TX 75006, (214) 492-2027; and Viewmax-80 ($199.95), from Micromax Systems, 6868 Nancy Ridge Dr., San Diego, CA 92121, (619) 457-3131.

The second method is to use a word-processing program that generates text using Apple's high-resolution graphics mode. Two programs that can display up to 70 columns of upper- and lowercase text with no additional hardware are Super-Text Home/Office ($125), from Muse Software, 347 North Charles St., Baltimore, MD 21201, (301) 659-7212 and Screen Writer II ($130), from Sierra On-Line, Sierra On-Line Bldg., Coarsegold, CA 93614, (209) 683-6858.

Printing 80-column program lines is simpler. Send your printer the following sequence:

```
PR#1
Control-I 80N
```

The first line initializes the printer card in slot 1, and the second toggles the Apple to print in 80-column mode. A carriage return should follow each of the lines.

I am interested in writing a program for commercial distribution and would like to know which programming language would be best to work with. I would prefer to use a higher-level language such as BASIC, but I don't want the user to load a compiler or interpreter each time the program is run. What can I do? **–Mary Clevenger**
Lewiston, MN

Most commercial programs are written in machine language, primarily because of the advantages it offers in speed of execution (especially when graphics displays are involved) and easier copy protection. Nonetheless, BASIC, Pascal, and FORTH are also popular commercial programming languages, despite the fact that the user must have the appropriate language in the computer before the program can be executed.

However, because many popular

Ask Popular is a monthly column conducted by contributing editors Harv Weiner and Steve Ciarcia to answer general questions about small computers. Send your questions to: Ask Popular, POB 397, Hancock, NH 03449.

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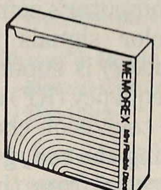

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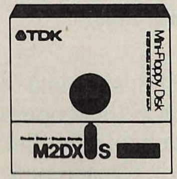

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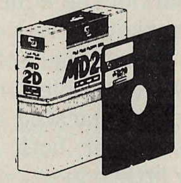

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home computers have versions of BASIC in ROM (read-only memory) that are active whenever the computer is on, they can run BASIC programs quite easily. If your program is intended for the home computer market and does not use complex graphics, writing it in BASIC should not be a big drawback.

I've been able to find virtually no educational software to use under the CP/M-80 operating system. Why don't the programmers who write educational software for machines like the Atari and Apple realize that CP/M users have children who could benefit from their software?
–David M. Boyd
Tampa, FL

Because computers that use the CP/M operating system are generally more expensive than the Atari and Apple, they are not commonly found in schools and have thus not been considered part of the educational computing market. Moreover, much of the best educational software relies heavily on graphics and color, both of which are lacking on most CP/M systems. For both of these reasons, very little educational software has been developed for computers that use the CP/M operating system.

Our church is interested in purchasing a computer, but we're not sure if there is any software specifically designed for church management. Can you tell us where to find such software?
–David T. Ansley
Dearing, GA

Management of church affairs is an excellent application for a personal computer, and many commercial software packages should fit your needs. Two programs designed specifically for church management are Compuchurch, for the TRS-80 Model III, from MTS Inc., POB 596, Niceville, FL 32578, (904) 678-3328; and Church Management, for the Apple II and IBM PC, from BPI Systems, 3423 Guadalupe, Austin, TX 78705, (512) 454-2801.

As is always the case when software requirements are as specific as yours, you should select your software first and then purchase the computer that will run it.

I have an Eagle PC computer and am having a problem with the software documentation. The manual that comes with GWBASIC frequently refers me to the *Microsoft BASIC User's Guide*, but this manual was not furnished with the computer. Where can I obtain a copy?
–John J. LoRe
White Stone, VA

You should be able to get the *Microsoft BASIC User's Guide* for the 8086/8088 microprocessors from any Eagle dealer for $29.95. It also includes the BASIC Reference Manual.

I'm having problems getting some of my disks to boot on my Apple IIe system. If I boot a good disk and then catalog one of the bad disks, I find that all of the files are intact and will run, so I assume that I have damaged the DOS on those disks. Is there a way to restore the DOS without destroying the files?
–Steve Landas
Orange, CA

The simplest way to restore the DOS (disk operating system) on your unbootable disks is to use the Master Create program that you'll find on your System Master disk. Start the program with BRUN and follow its directions. The data on the disk will not be affected in any way.

Also, several disk-copy programs —Super Disk Copy III from Sensible Software Inc., 24011 Seneca St., Oak Park, MI 48237, (313) 399-8877 ($34.95) is one—have provisions for copying just the DOS from one disk to another. DOS resides on tracks 0 through 2, so if your copy program will copy track by track, you can simply transfer these tracks from a disk you know is good.

I recently purchased a Commodore 64 computer and would like to know where I can get free public-domain software.
–David Delibato
Stoney Creek, ON

Public-domain software is essentially free, although small charges are usually added to cover the costs of handling and disks or cassettes. One source of such software is the United States Commodore Users Group (POB 2310, Roseburg, OR 97470). The annual membership fee of $20 will get you access to hundreds of VIC-20 and Commodore 64 public-domain programs, 10 issues of *Command Performance* magazine, and technical and consumer assistance.

Public Domain Inc. (5025 South Rangeline Rd., West Milton, OH 45383; (513) 698-5638) also distributes public-domain software. A collection of more than 25 programs for the Commodore 64 is available on tape or disk for $10, and a catalog is yours for the asking.

I own a Radio Shack TRS-80 Color Computer and am interested in connecting it to an RGB monitor. Is it possible to build an interface to split the composite-video signal into the three separate signals needed for an RGB monitor?
–Craig Wallace
Littleton, CO

Yes, but it is not easy. The Color Computer's composite-video output (color signals plus synchronizing pulses) is superimposed on a radio frequency (RF) signal corresponding to television channel 3 or 4. Separating the red, green, and blue color signals from the composite signal will take two steps.

First, an RF demodulator, tuned to the television channel, must be used to strip the composite signal from the RF signal. You'd then need a color decoder circuit to separate the color information and the synchronizing pulses. These signals would then be sent to the monitor with proper voltage and impedances.

You could use commercially available demodulators and decoders, but they are rather expensive because they are designed for the television industry. However, building such units is not a project for the beginner, as some of the circuits are quite critical for proper color separation.

The graphics resolution of the Color Computer is 256 horizontal dots by 192 vertical dots, and only four colors can be displayed. The improvement that an RGB monitor can lend to such a display may not warrant the costs involved in creating the RGB signals. □

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